South Layton Interchange

Environmental Impact Statement

Traffic Study Report

September 13 , 2007

- Draft -

Prepared By

HORROCKS

ENGINEERS

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INTRODUCTION

This report presents the findings and recommendations of the traffic analysis study for the South Layton Interchange Environmental Impact Statement (EIS). The objective of the traffic study is to determine whether the various alternatives examined for the EIS meet the purpose and need of the project which is:

> *Address current and projected traffic demand and operations for the South Layton Interchange (I-15 Exit 330), provide grade-separated transportation access across the Union Pacific Railroad to the developing area of west Layton, and provide adequate transportation facilities and traffic capacity west of I-15 to relieve existing and projected traffic congestion by providing Level-of-service D or better on Gentile Street.*

This report will present the methodology used to determine future traffic volumes and operations for each of the alternatives. The results, findings, and recommendations of the study will also be presented.

STUDY AREA

The proposed project area will extend from the Kaysville 200 North Interchange on the south to the Hill Field Interchange on the north and along an east-west corridor from approximately Fort Lane Street to approximately 3200 West (see Exhibit 1). The project study area lies within Layton City and Kaysville City in Davis County, Utah.

Figure 1: Project Study Area

EXISTING (2006) CONDITIONS

Existing (2006) intersection traffic volumes were counted during the PM peak hour on Hill Field Rd. and Gentile Street in Layton, and 200 North in Kaysville. The intersection study locations and movement volumes are shown on Figure 2 and Table 3, respectively

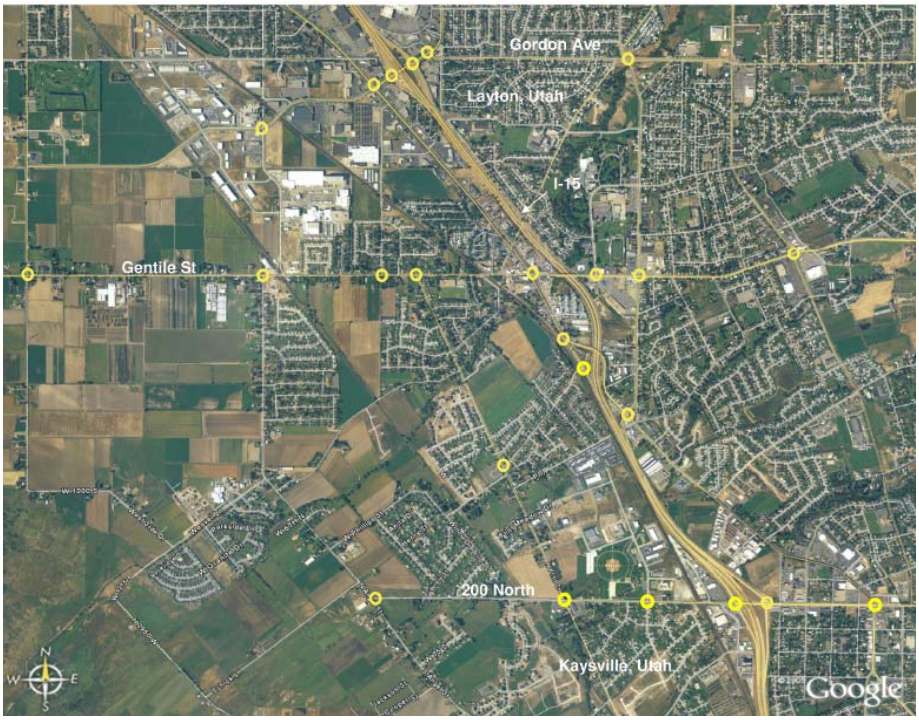

Figure 2: Project Intersection Study Locations

Table 1: So. Layton EIS Existing Traffic Volume Summary

	Intersection Traffic Volumes (DHV)											
	Year 2006											
	EB			WB			NB			SB		
Intersections	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt
Hill Field Rd & Sugar St	2	399	33	146	484	4	44	0	48	15	0	12
Hill Field Rd & Main St	157	660	156	497	681	455	136	572	471	310	783	117
Hill Field Rd & SB Ramp	0	1245	209	306	1261	0	0	0	0	341	0	387
Hill Field Rd & NB Ramp	353	1214	0	0	1245	344	351	0	333	0	0	0
Hill Field Rd & Gordon Ave	289	749	475	240	845	37	408	134	150	6	96	248
Gordon Ave & Fort Lane	84	540	149	22	451	79	172	170	7	45	170	98
Gentile St. & 2200 West	22	273	9	9	509	96	23	11	5	60	17	37
Gentile St. & Angel St.		376	0	275	585		48		189			
Gentile St. & King St.	51	513		745	72					76		116
Gentile St. & Flint St.		413	91	117	663	125		111				
Gentile St. & Main St.	99	273	191	149	333	344	322	671	95	383	688	42
Gentile St. & Wasatch	72	686			649	90				95		166
Gentile St & Fort Lane	84	519	55	44	460	78	91	288	141	90	174	96
Gentile St. & Fairfield Rd.	167	337	86	113	301	135	140	323	106	148	344	160
Fort Lane & Main St.	13	386	0	0	481	192	491	279	88	210	0	27
900 So. & Main St.	0	99	10	0	0	0	0	0	0	0	461	151
900 So. & Flint Dr.	23		55					225	50	30	107	
200 North & Angel St.	7	6	0	78	13	158	1	49	76	90	62	2
200 North & Flint St.	6	240	20	36	430	165	23	14	20	120	17	0
200 North & Kays Dr.	6	370	3	100	600	100	13	0	76	200	0	18
200 North & SB Ramp	0	670	133	230	770	0	0	0	0	936	0	185
200 North & NB Ramp	257	1357	0	0	680	555	338	0	519	0	0	0
200 North & Main St.	144	420	764	222	381	160	505	563	275	180	606	50

Existing traffic volumes for corridor segments were developed for north-south and east-west corridors in the study area. An existing corridor Level of Service was determined for each segment using Horrocks Engineers' Maximum Daily Traffic Capacity estimate table (see Appendix F). The existing corridor traffic volumes, functional classification, number of lanes, and corridor Level of Service are shown in Table 4.

Table 2: Traffic Operations Summary

Corridor Volumes and Level of Service - Year 2006				
	Peak Hour Traffic Volumes	Functional Classification	Lanes	Level of Service
East-West Streets				
Hill Field Rd - 2200 West to Sugar St.	1000	Arterial	5	B
Hill Field Rd - Sugar St. to Main St.	1900	Arterial	5	B
Hill Field Rd interchange area	3200	Arterial	5	E
North Hill Field Rd	2000	Arterial	5	B
Gordon Ave.- Hill Field Rd to Fort Lane	1500	Arterial	5	B
Gordon Ave. - Fort Lane to Fairfield Rd	1200	Arterial	2	A
Gentile - 2200 West to Angel St.	1000	Arterial	2	C
Gentile - Angel St to Flint St.	1400	Arterial	2	E
Gentile - Flint St to Main St.	1300	Arterial	2	D
Gentile - Main St. to Fort Lane	1600	Arterial	3	F
Gentile - Fort Lane to Fairfield Rd	1300	Arterial	3	D
Gentile - East of Fairfield Rd	1200	Arterial	2	E
900 South - Flint St. to Main St.	200	Collector	2	A
200 North - 2200 West to Angel St.	50	Arterial	2	A
200 North - Angel St to Flint St.	700	Arterial	2	B
200 North - Flint St to I-15	1400	Arterial	3	E
200 North Interchange area	2600	Arterial	5	C
200 North - I-15 to Main St.	2900	Arterial	5	D
200 North - Main St to Fairfield Rd.	1600	Arterial	3	F
North South Streets				
2200 West - Hill Field Rd to Gentile	300	Collector	2	A
2200 West - Gentile to 700 South	100	Collector	2	A
Angel St.- Gentile to 700 South	400	Collector	2	A
Angel St.- 700 South to 200 North	400	Collector	2	A
Angel St. - South of 200 North	300	Collector	2	A
Sugar St. - Hill Field Rd to Gentile St	300	Collector	2	A
King St. - Gentile St. to Main St.	300	Collector	2	A
Flint St - Gentile to 900 South	400	Collector	2	A
Flint St - 900 South to 200 North	400	Collector	2	A
Flint St south of 200 No	200	Collector	2	A
Main Street - Antelope Dr to Hill Field Rd	2400	Arterial	5	C
Main Street - Hill field Rd to Gentile St	2600	Arterial	5	C
Main Street - Gentile St to I-15	2100	Arterial	5	C
Main Street - I-15 to Fort Lane	1400	Arterial	2	E
Main Street - Fort Lane to 200 North	1700	Arterial	2	F
Main Street South of 200 No	2900	Arterial	5	D
Wasatch Drive - Gentile St. to Fort Lane	400	Collector	3	A
Fort Lane North of Gordon Av	700	Collector	3	B
Fort Lane -Gordon Ave. to Gentile St	800	Collector	3	C
Fort Lane - Gentile St to Main St.	800	Collector	3	C
Fairfield Rd North of Gentile St.	1300	Collector	3	E
Fairfield Rd South of Gentile St.	1100	Collector	3	D

TRAVEL DEMAND MODELING

The South Layton Interchange Environmental Impact Statement (EIS) traffic modeling and operations analyses have been extensive processes, which is detailed in the following paragraphs. The Wasatch Front Regional Council's (WFRC) travel demand model V4.3 was chosen as the primary tool to determine the 2030 traffic demand for the study area. At the beginning of the traffic study in June 2006, V4.3 was the latest version of the model. (Note: WFRC has subsequently released V6.0, but it was determined that it was too late in the process to re-do the travel demand modeling and use the new version of the model.)

Socio-Economic Demographics

The first process in using the model was to validate and update the socio-economic data for Syracuse, Layton, and Kaysville that would be used in the model. This demographic data update is documented in Appendix A in the memorandum, "Travel Demand Modeling and Traffic Volume Forecasting Methodologies for the Layton I-15 Interchange EIS Project."

Initial Model Run

To help define the purpose and need for the project, the 2030 "no-action" traffic volumes were developed using the WFRC travel demand model with the socio-economic updates described above. These volumes were used to estimate intersection and segment Level of Service (LOS) and travel times for the corridors in the study area. The preliminary analysis and data are provided in Appendix B.

Alternative Development Model Runs

Once the socio-economic data update was finalized, the model was run for several alternatives including:

- Alternative 1: Seven Lanes on 200 North in Kaysville from Legacy Parkway to I-15.
- Alternative 2: Full Interchange at 750 South in Layton.
- Alternative 3: Five Lanes on Gentile Street with a Full Interchange at I-15 and Gentile Street.
- Alternative 4: Five Lanes on Gentile Street with a Half Interchange at I-15 and Gentile Street.
- Alternative 5: Improved Hill Field Road, Hill Field Road Interchange, and Gordon Avenue Flyover. This alternative came as a result from public input at the September 26, 2006 open house.

The results of these initial runs of the model showed very little change in travel demand between the alternatives for the major east-west corridors (i.e. Gentile Street, 750 South, 200 North Kaysville, and Hill Field Road). As such, none of the alternatives met the

purpose and need of the EIS which, in part, was to "provide adequate transportation facilities and traffic capacity west of I-15 to relieve existing and projected traffic congestion by providing Level-of-service D or better on Gentile Street."

Traffic Analysis Zone Splits

Horrocks Engineers determined that the WFRC's traffic analysis zones (TAZ), which are used for regional travel demand modeling, were too large for the level of detail needed for this study. In order to obtain results on a smaller scale, the TAZ's needed to be split into smaller sub-zones. Therefore, a "subarea" model was prepared with smaller TAZ's (see Figure 3, below), and re-run. An analysis of these results showed some improvement in the sensitivity of the travel demand between the alternatives. However, the overall results still showed that none of the alternatives relieving traffic congestion on Gentile Street.

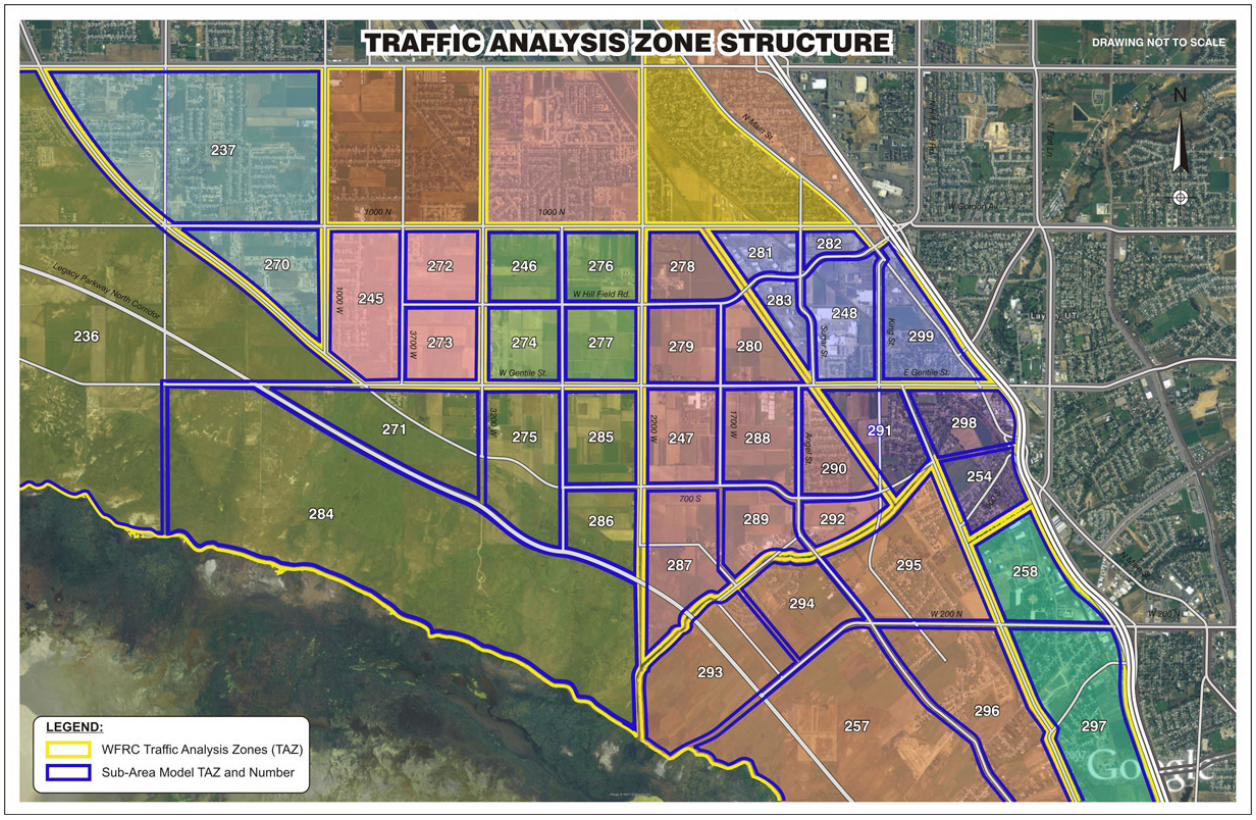

Figure 3: Subarea Model TAZ Structure

Additional Model Refinement

To determine whether the results of the travel demand model were realistic, Mike Brown (Wilbur Smith) was consulted to review the sub-area model. Mike Brown was a previous employee of WFRC who helped build the model. He pointed out several issues with the model that could improve the accuracy of the results. The most significant recommendation was to assign more appropriate functional classes to each

of the roadways within the study area. The WFRC model is very sensitive to speeds on roadways, which are determined by their functional class. Initially, the roadways were only updated for number of lanes. However, they also should have been updated for functional class, such as from a collector to a minor arterial. Other recommendations relating to area type and capacity of the roadways to, determine whether the model was correctly calculating these values, were also considered in the analysis.

After reviewing and updating the roadways in the study area for functional class, capacity, speed, and area type, the subarea model was re-run for each of the alternatives. The results showed considerable improvement over the previous model runs. In other words, if an alternative had a roadway widening, the results showed a corresponding increase in travel demand, as would be expected.

Model Network Update

At this point, the model and the results were reviewed by the Technical Advisory Committee (TAC) in early April, 2007. Layton City officials desired to have additional streets included in the model street network based on the City's Master Street Plan and other corridors they deemed significant. Subsequently, the model network was updated to include: (1) 1700 West extension to Gordon Avenue; (2) Marshall Way as a local street; (3) Weaver Lane between Angel Street and Flint Street as a local street; and (4) 900 South between Flint Street and the I-15 Southbound On-Ramp.

Alternative Refinement and Additional Model Runs

The model was again re-run for the alternatives and the results were analyzed. Throughout the month of April 2007, additional improvements and refinements were made to the model, along with the appropriate model runs. These refinements included making adjustments to functional classes and speeds to various roadways. The most significant modification was to extend King Street as a five lane roadway southward from Gentile Street to 200 North. Layton City officials said this improvement would be added to the City's Master Street Plan, so in effect, the King Street extension became a "base" condition for all the alternatives. Using these results, the No-Action and Alternatives 1 and 5 were screened out because of insufficient roadway capacity, and not meeting the purpose and need.

Table 3, below, shows a summary of the results used to screen out alternatives 1 and 5 based on roadway capacity. The detailed LOS summary maps can be found in Appendix C. Table 3, below, lists the alternatives that were included in the screening process, and, Table 5, shows other alternatives that were not included in this screening process. The "other" alternatives were created during the model refinement process and were dropped as major improvements to the model were implemented. They are listed below to show the history of the alternative development process.

Table 3: Layton EIS Alternative Analysis

YEAR 2030 ADT/ LOS FOR GENTILE STREET

Alternatives	I-15 to Flint		Flint to King		King to Sugar		Sugar to Angel	
	Volume	LOS	Volume	LOS	Volume	LOS	Volume	LOS
No Build	18500	F	21500	F	15100	F	24700	F
1A	20000	F	20600	F	15500	E	25000	F
1C	20000	F	20500	F	14800	F	25800	F
1E	21500	F	20500	F	13100	E	17800	F
1F	20000	F	21500	F	12800	D	17200	F
2A	12100	D	14100	E	11900	D	20800	F
2D	10200	C	15600	E	11500	C	21600	F
2E	10200	C	15100	E	10700	C	21500	F
2F	11900	D	12400	D	11200	C	16100	E
2G	11300	C	12600	D	12000	D	15800	E
2H	12440	D	13000	D	11600	D	15700	E
2I	9400	C	12700	D	7900	B	14500	E
3A	33000	E	32900	E	24900	C	32600	E
3B	37800	C	35500	C	26200	B	33500	C
3C	37200	E	37600	E	18400	B	21800	C
4A	33200	E	31700	E	24100	C	32000	D
4B	37800	E	36400	E	17800	B	21200	C
5B	18200	F	19000	F	11700	E	27500	F
5C	18500	F	20400	F	10600	C	27100	F
5D	18500	F	20600	F	10900	C	26900	F
5E	19200	F	21000	F	9000	C	16500	F
5F	19700	F	20300	F	9000	C	16300	F

Table 4: South Layton Interchange EIS Alternative Descriptions

Alternative	Brief Description
Base	Includes the WFRC Long Range Plan V43 (minus the Layton 750 South Interchange) and Layton City TMP Roads and selected local roads.
1E	7 Lanes on 200 North from Legacy Parkway to I-15; King St. Extension as 3 Lanes
1F	7 Lanes on 200 North from Legacy Parkway to I-15; King St. Extension as 5 Lanes
2G	Full Interchange at I-15 Milepost #330; 7 Lanes on 750 South from Flint St. to Fort Lane; King St. Extension as 5 Lanes
2H	Full Interchange at I-15 Milepost #330; 5 Lanes on 750 South from Flint St. to Fort Lane; King St. Extension as 5 Lanes; 7 Lanes on 200 North from Legacy Parkway to I-15
2I	Full Interchange at I-15 Milepost #330; 5 Lanes on 750 South from Flint St. to Fort Lane; King St. Extension as 5 Lanes; 7 Lanes on 200 North from Legacy Parkway to I-15; 7 Lanes on Hill Field Road from East Gordon Ave. to 1700 West
3C	Full interchange at I-15 and Gentile St.; 5 Lanes on Gentile from I-15 to Angel St.; King St. Extension as 5 Lanes
4B	Half interchange at I-15 and Gentile St.; 5 Lanes on Gentile from I-15 to Angel St.; King St. Extension as 5 Lanes; Remove existing 900 S railroad crossing
5E	7 Lanes on Hill Field Road from East Gordon Ave. to 1700 West; 5 Lanes on Sugar St. from Hill Field Road to Gentile; Gordon Ave. Flyover over I-15 (East to West Gordon Ave.); 5 Lanes on King St. from Main St. to Gentile; King St. Extension as 5 Lanes
5F	7 Lanes on Hill Field Road from East Gordon Ave. to 1700 West; 5 Lanes on Sugar St. from Hill Field Road to Gentile; Gordon Ave. Flyover over I-15 (East to West Gordon Ave.); 5 Lanes on King St. from Main St. to Gentile; King St. Extension as 5 Lanes; 7 Lanes on 200 North from Legacy Parkway to I-15

Table 5: Alternatives Dropped Prior to Roadway Capacity Screening

Alternative	Brief Description
1A	7 Lanes on 200 North from Legacy Parkway to I-15; No King St. Extension
1B	7 Lanes on 200 North from Legacy Parkway to I-15; 5 Lanes on Flint and Angel from 750 S to 200 N; No King St. Extension
1C	7 Lanes on 200 North from Legacy Parkway to I-15; 5 Lanes on Flint and Angel from Gentile to 200 N; No King St. Extension
1D	7 Lanes on 200 North from Legacy Parkway to I-15; 5 Lanes on Flint and Angel from Gentile to 200 N; 5 Lanes on Sugar St. from Gordon Ave. to Gentile; No King St. Extension
2A	Full Interchange at I-15 Milepost #330; 5 Lanes on 750 South from Flint St. to Fort Lane; No King St. Extension
2B	Full Interchange at I-15 Milepost #330; 5 Lanes on 750 South from Flint St. to Fort Lane; 5 Lanes on Flint and Angel from 750 S to 200 N; No King St. Extension
2C	Full Interchange at I-15 Milepost #330; 5 Lanes on 750 South from Flint St. to Fort Lane; 5 Lanes on Flint and Angel from Gentile to 750 S; No King St. Extension
2D	Full Interchange at I-15 Milepost #330; 5 Lanes on 750 South from Flint St. to Fort Lane; 5 Lanes on Flint and Angel from Gentile to 200 N; No King St. Extension
2E	Full Interchange at I-15 Milepost #330; 7 Lanes on 750 South from Flint St. to Fort Lane; 5 Lanes on Flint and Angel from Gentile to 200 N; No King St. Extension
2F	Full Interchange at I-15 Milepost #330; 7 Lanes on 750 South from Flint St. to Fort Lane; King St. Extension as 3 Lanes
3A	Full interchange at I-15 and Gentile St.; 5 Lanes on Gentile from I-15 to Angel St.; No King St. Extension
3B	Full interchange at I-15 and Gentile St.; 7 Lanes on Gentile from I-15 to Angel St.; 5 Lanes on Flint from Gentile to 200 N; No King St. Extension
4A	Half interchange at I-15 and Gentile St.; 5 Lanes on Gentile from I-15 to Angel St.; No King St. Extension; Remove existing 900 S railroad crossing
5A	9 Lanes on Hill Field Road from East Gordon Ave. to Sugar St.; 7 Lanes on Hill Field Road from Sugar St. to 1700 West; 5 Lanes on Sugar St. from Hill Field Road to Gentile; No King St. Extension
5B	9 Lanes on Hill Field Road from East Gordon Ave. to Sugar St.; 7 Lanes on Hill Field Road from Sugar St. to 1700 West; 5 Lanes on Sugar St. from Hill Field Road to Gentile; No King Street Extension; Gordon Ave. Flyover over I-15 (East to West Gordon Ave.)
5C	9 Lanes on Hill Field Road from East Gordon Ave. to Sugar St.; 7 Lanes on Hill Field Road from Sugar St. to 1700 West; 5 Lanes on Sugar St. from Hill Field Road to Gentile; No King St. Extension; Gordon Ave. Flyover over I-15 (East to West Gordon Ave.); 5 Lanes on King St. from Main St. to Gentile
5D	7 Lanes on Hill Field Road from East Gordon Ave. to 1700 West; 5 Lanes on Sugar St. from Hill Field Road to Gentile; No King St. Extension; Gordon Ave. Flyover over I-15 (East to West Gordon Ave.); 5 Lanes on King St. from Main St. to Gentile

Regional Transportation Plan Update

During this process, the WFRC adopted the V6.0 as the official travel demand model. About the middle of May, 2007, the WFRC agreed that switching to the V6.0 model for the Layton Interchange EIS was probably not feasible, but they wanted to add the major Regional Transportation Plan (RTP) roads into the Layton V4.3 subarea model. By the end of May, the WFRC had updated the Layton V4.3 subarea model to include the latest improvements for I-15 and Legacy Parkway. Initially, the new network and model run resulted in about half the traffic volume on Legacy Parkway than had been shown in previous model runs. In consultation with Ned Hacker (WFRC), it was agreed that Legacy Parkway should be modeled as a 50 mph roadway. The model was again updated and re-run for the remaining alternatives. The comparison of the alternatives, shown in Table 6, below, verifies that the screening out of alternatives 1 and 5 was appropriate. In addition, the review of the results by the TAC and CSB supported the action to screen out alternatives 1 and 5.

Table 6: YEAR 2030 ADT/ LOS FOR GENTILE STREET

	I-15 to Flint		Flint to King		King to Sugar		Sugar to Angel	
Alternatives	Volume	LOS	Volume	LOS	Volume	LOS	Volume	LOS
No Build	21300	F	22000	F	12400	D	17500	F
1E	20700	F	20400	F	12500	D	17500	F
1F	20800	F	21500	F	12300	D	17000	F
2G	12200	D	13300	D	12300	D	15600	E
2H	12300	D	13400	D	12200	D	15400	E
2I	10800	C	13000	D	9500	C	14200	E
3C	36400	E	36800	E	18800	B	21500	C
4B	34900	E	35700	E	17900	B	21000	C
5E	20100	F	20900	F	9900	C	15900	E
5F	19400	F	20300	F	9800	C	15700	E

These final model runs were used as the 2030 travel demand volumes for the remaining alternatives. Once the daily traffic volumes were determined, the traffic operations analysis was refocused from roadway capacity to the intersection level. The 2030 daily traffic volumes were converted into PM peak hour turning movement volumes. These volumes were analyzed for Gentile Street and 750 South using the *Highway Capacity Manual* methodology in the Synchro software package. A detailed presentation of these results will be shown in the following section.

INTERSECTION LEVEL OF SERVICE ANALYSIS

Alternatives

It was the decision of the TAC to carry six alternatives forward and evaluate purpose and need using intersection LOS screening. Initially, Alternative 2F had been dropped from further evaluation, but it was included in the intersection LOS screening to determine whether King Street Extension needed to be three or five lanes. The six alternatives are as follows.

Table 7: Alternatives Evaluated in Intersection LOS Screening

2F	Full Interchange at I-15 Milepost #330; 7 Lanes on 750 South from Flint St. to Fort Lane; King St. Extension as 3 Lanes
2G	Full Interchange at I-15 Milepost #330; 7 Lanes on 750 South from Flint St. to Fort Lane; King St. Extension as 5 Lanes
2H	Full Interchange at I-15 Milepost #330; 5 Lanes on 750 South from Flint St. to Fort Lane; King St. Extension as 5 Lanes; 7 Lanes on 200 North from Legacy Parkway to I-15
2I	Full Interchange at I-15 Milepost #330; 5 Lanes on 750 South from Flint St. to Fort Lane; King St. Extension as 5 Lanes; 7 Lanes on 200 North from Legacy Parkway to I-15; 7 Lanes on Hill Field Road from East Gordon Ave. to 1700 West
3C	Full interchange at I-15 and Gentile St.; 5 Lanes on Gentile from I-15 to Angel St.; King St. Extension as 5 Lanes
4B	Half interchange at I-15 and Gentile St.; 5 Lanes on Gentile from I-15 to Angel St.; King St. Extension as 5 Lanes; Remove existing 900 S railroad crossing

2030 PM Peak Hour Volumes

Based on the WFRC Travel Demand Model results and other traffic count data in the study area, the PM peak hour was determined to have higher traffic volumes than the AM peak hour. Therefore, the PM peak was considered the controlling period, and the AM peak was not included in the operational analysis. A comparison of AM vs. PM is included in Appendix G.

The 2030 PM peak hour turning movement volumes were calculated based on the 2006 traffic counts and adjusted to match the corridor volumes as projected by the Travel Demand Model for each alternative. The 2030 turning movement volumes can be found in Appendix D.

Traffic Operations Analysis

The intersection LOS analysis was performed using the *Highway Capacity Manual* methodology in the Synchro/SimTraffic version 7 software package for each of the alternatives. A tabulation of the analysis results for the study intersections on Gentile Street and 750 South from 2200 west to Fort Lane are shown in Tables 8-13, below.

Additional details can be found in Appendix H. A discussion of the results of the traffic operations analysis follows the Tables.

Table 8: Alternative 2F 2030 Intersection Analysis (HCM)
(King Street Extension as 3-Lane; 750 South Full Interchange)
8/24/2007

Intersection	Control	EB		WB		NB		SB		Average Intersection	
		Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
Gentile Street											
2200 West	Signal	7.6	A	10.0	A	11.1	B	11.1	B	9.8	A
1700 West	Signal	6.2	A	7.3	A	17.1	B	17.6	B	9.6	A
Angel Street	Signal	23.4	C	10.2	B	20.9	C	-	-	15.7	B
Sugar Street	Stop	2.5	A	0.0	A	-	-	>100	F	*	*
King Street	Signal	31.0	C	46.1	D	48.2	D	54.5	D	44.1	D
Flint Street	Stop	0.0	A	1.7	A	>100	F	-	-	*	*
Main Street	Signal	53.9	D	59.8	E	69.5	E	52.0	D	58.9	E
Wasatch Drive	Signal	4.2	A	4.6	A	-	-	28.4	C	7.4	A
Fort Lane	Signal	6.2	A	20.9	C	33.3	C	31.6	C	21.4	C
Main Street ALT 1 (1)	Signal	39.6	D	39.7	D	48.8	D	36.5	D	41.0	D
Main Street ALT 2 (2)	Signal	48.6	D	25.4	C	47.1	D	43.8	D	40.9	D
Sugar/Angel Street (3)	Signal	21.1	C	9.8	A	16.2	B	22.5	C	15.8	B
*The HCM does not define intersection-wide delay for two-way stop controlled intersections.											
750 South											
2200 West	Signal	16.4	B	20.3	C	15.2	B	15.0	B	17.8	B
1700 West	Signal	12.3	B	12.3	B	-	-	11.0	B	12.2	B
Angel Street	Signal	9.4	A	3.4	A	31.6	C	33.9	C	14.5	B
King Street	Signal	18.0	B	16.7	B	33.0	C	35.0	C	23.0	C
Flint Street	Signal	29.7	C	13.6	B	38.2	D	64.5	E	25.5	C
Main Street	Signal	17.4	B	16.4	B	-	-	54.7	D	24.9	C
I-15 (SPUI)	Signal	26.3	C	25.7	C	35.8	D	27.6	C	28.7	C
Fort Lane	Signal	35.2	D	-	-	33.6	C	16.6	B	29.7	C
Flint Street (4)	Signal	52.2	D	18.0	B	74.5	E	64.8	E	39.3	D
Main Street (4)	Signal	13.2	B	41.2	D	-	-	63.1	E	36.5	D
I-15 (SPUI) (4)	Signal	42.2	D	49.8	D	45.3	D	27.8	C	44.0	D
Fort Lane (4)	Signal	36.2	D	-	-	39.6	D	20.9	C	32.9	C

(1) Main Street Alt 1: Widen Gentile Street to 5-Lanes for 500 ft west of Main Street; Add NB dual left turn lanes.
(2) Main Street Alt 2: Widen Main Street to 7-Lanes north and south of Gentile Street.
(3) Sugar/Angel Street: Re-align Sugar Street to connect with Angel Street.
(4) 750 South with 5-Lanes between Flint Street and Fort Lane.

Table 9: Alternative 2G 2030 Intersection Analysis (HCM)
(King Street Extension as 5-Lane; 750 South Full Interchange)
8/24/2007

Intersection	Control	EB		WB		NB		SB		Average Intersection	
		Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
Gentile Street											
2200 West	Signal	7.4	A	9.7	A	11.1	B	11.3	B	9.7	A
1700 West	Signal	6.2	A	7.3	A	17.1	B	17.6	B	9.6	A
Angel Street	Signal	23.0	C	9.1	A	20.9	C	-	-	14.9	B
Sugar Street	Stop	12.2	B	0.0	A	-	-	>100	F	*	*
King Street	Signal	35.1	D	32.1	C	35.8	D	33.6	C	34.0	C
Flint Street	Stop	0.0	A	10.0	A	>100	F	-	-	*	*
Main Street	Signal	52.3	D	49.0	D	76.4	E	49.8	D	57.2	E
Wasatch Drive	Signal	4.3	A	4.1	A	-	-	30.0	C	7.5	A
Fort Lane	Signal	14.5	B	27.9	C	29.5	C	32.2	C	25.4	C
Main Street ALT 1 (1)	Signal	36.0	D	54.5	D	48.8	D	39.6	D	45.2	D
Main Street ALT 2 (2)	Signal	50.2	D	41.8	D	54.5	D	54.6	D	50.8	D
Sugar/Angel Street (3)	Signal	19.6	B	9.5	A	15.9	B	20.5	C	14.8	B
*The HCM does not define intersection-wide delay for two-way stop controlled intersections.											
750 South											
2200 West	Signal	16.4	B	20.3	C	15.2	B	15.0	B	17.8	B
1700 West	Signal	12.3	B	14.5	B	-	-	11.0	B	13.4	B
Angel Street	Signal	6.1	A	3.1	A	31.8	C	34.9	C	13.6	B
King Street	Signal	24.0	C	15.0	B	33.4	C	36.4	D	24.3	C
Flint Street	Signal	18.5	B	8.9	A	47.8	D	47.9	D	20.1	C
Main Street	Signal	18.2	B	14.9	B	-	-	53.5	D	24.3	C
I-15 (SPUI)	Signal	32.0	C	28.1	C	36.9	D	28.1	C	31.9	C
Fort Lane	Signal	37.5	D		-	38.4	D	15.8	B	31.8	C
Flint Street (4)	Signal	21.8	C	21.5	C	6.8	A	43.6	D	20.7	C
Main Street (4)	Signal	30.4	C	26.9	C	-	-	49.0	D	32.8	C
I-15 (SPUI) (4)	Signal	38.1	D	40.9	D	51.3	D	25.7	C	41.3	D
Fort Lane (4)	Signal	25.7	C	-	-	36.3	D	18.0	B	26.4	C
SB Ramps (5)	Signal	15.9	B	10.8	B	-	-	14.3	B	13.5	B
NB Ramps (5)	Signal	17.1	B	33.7	C	42.2	D	-	-	29.4	C
Flint Street (6)	Signal	39.0	D	14.7	B	40.4	D	41.0	D	27.3	C
Main Street (6)	Signal	19.8	B	27.2	C	-	-	49.0	D	29.4	C
SB Ramps (6)	Signal	15.3	B	12.6	B	-	-	16.2	B	14.4	B
NB Ramps (6)	Signal	23.7	C	33.0	C	45.7	D	-	-	32.8	C
Fort Lane (6)	Signal	24.6	C	-	-	36.3	D	18.0	B	25.9	C

(1) Main Street Alt 1: Widen Gentile Street to 5-Lanes for 500 ft west of Main Street; Add NB dual left turn lanes.
(2) Main Street Alt 2: Widen Main Street to 7-Lanes north and south of Gentile Street.
(3) Sugar/Angel Street: Re-align Sugar Street to connect with Angel Street.
(4) 5 Lanes on 750 South Between Fint Street and Fort Lane; SPUI Interchange
(5) 7 Lanes on 750 South Between Flint Street and Fort Lane; Tight Diamond Interchange
(6) 5 Lanes on 750 South Between Flint Street and Fort Lane; Tight Diamond Interchange

Table 10: Alternative 2H 2030 Intersection Analysis (HCM)
(Alt 2G with 200 North 7-Lanes and 750 South 5-Lanes)
8/24/2007

Intersection	Control	EB		WB		NB		SB		Average Intersection	
		Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
Gentile Street											
2200 West	Signal	7.8	A	10.6	B	11.2	B	10.9	B	10.1	B
1700 West	Signal	6.1	A	7.4	A	18.4	B	18.8	B	10.2	B
Angel Street	Signal	20.4	C	10.4	B	18.5	B	-	-	14.5	B
Sugar Street	Stop	11.8	B	0.0	A	-	-	>100	F	*	*
King Street	Signal	34.9	C	38.5	D	27.9	C	28.5	C	32.8	C
Flint Street	Stop	0.0	A	10.2	B	>100	F	-	-	*	*
Main Street	Signal	67.9	E	62.6	E	68.1	E	53.5	D	61.4	E
Wasatch Drive	Signal	5.2	A	4.2	A	-	-	33.1	C	7.7	A
Fort Lane	Signal	8.4	A	29.2	C	31.4	C	34.1	C	24.4	C
Main Street ALT 1 (1)	Signal	47.8	D	42.4	D	50.7	D	37.2	D	43.3	D
Main Street ALT 2 (2)	Signal	51.9	D	42.8	D	45.1	D	40.9	D	43.9	D
Sugar/Angel Street (3)	Signal	17.5	B	7.3	A	16.4	B	17.1	B	12.8	B
*The HCM does not define intersection-wide delay for two-way stop controlled intersections.											
750 South											
2200 West	Signal	16.3	B	19.2	B	15.2	B	15.0	B	17.2	B
1700 West	Signal	12.1	B	13.1	B		-	10.6	B	12.5	B
Angel Street	Signal	9.4	A	6.5	A	25.0	C	23.7	C	13.8	B
King Street	Signal	26.3	C	14.1	B	36.1	D	35.8	D	25.9	C
Flint Street	Signal	17.4	B	9.1	A	34.1	C	43.2	D	18.0	B
Main Street	Signal	17.4	B	27.3	C		-	62.5	E	32.3	C
I-15 (SPUI)	Signal	33.5	C	30.7	C	23.9	C	40.0	D	33.5	C
Fort Lane	Signal	33.9	C		-	36.3	D	13.5	B	28.9	C

(1) Main Street Alt 1: Widen Gentile Street to 5-Lanes for 500 ft west of Main Street; Add NB dual left turn lanes.
(2) Main Street Alt 2: Widen Main Street to 7-Lanes north and south of Gentile Street.
(3) Sugar/Angel Street: Re-align Sugar Street to connect with Angel Street.

Table 11: Alternative 2I 2030 Intersection Analysis (HCM)
(Alt 2G with 200 North 7-Lanes, Hill Field Road 7-Lanes, and 750 South 5-Lanes)
8/24/2007

Intersection	Control	EB		WB		NB		SB		Average Intersection	
		Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
Gentile Street											
2200 West	Signal	7.4	A	10.1	B	11.9	B	11.5	B	10.0	A
1700 West	Signal	7.9	A	10.3	B	11.3	B	13.1	B	10.6	B
Angel Street	Signal	20.2	C	9.1	A	18.5	B	-	-	13.7	B
Sugar Street	Stop	11.8	B	0.0	A	-	-	>100	F	*	*
King Street	Signal	61.6	E	36.7	D	35.6	D	40.6	D	42.2	D
Flint Street	Stop	0.0	A	9.9	A	>100	F	-	-	*	*
Main Street	Signal	39.5	D	26.7	C	54.5	D	57.9	E	46.3	D
Wasatch Drive	Signal	4.9	A	5.6	A	-	-	33.2	C	8.6	A
Fort Lane	Signal	6.8	A	21.5	C	35.7	D	29.8	C	20.9	C
Main Street ALT 1 (1)	Signal	34.2	C	29.1	C	38.5	D	33.8	C	33.9	C
Main Street ALT 2 (2)	Signal	35.5	D	24.0	C	37.6	D	40.8	D	34.8	C
Sugar/Angel Street (3)	Signal	18.1	B	8.3	A	15.5	B	18.4	B	13.6	B
*The HCM does not define intersection-wide delay for two-way stop controlled intersections.											
750 South											
2200 West	Signal	15.5	B	18.3	B	15.2	B	15.0	B	16.6	B
1700 West	Signal	11.3	B	12.7	B		-	10.9	B	12.0	B
Angel Street	Signal	9.3	A	11.8	B	15.4	B	14.8	B	12.4	B
King Street	Signal	25.6	C	18.1	B	34.2	C	39.0	D	29.0	C
Flint Street	Signal	14.2	B	5.5	A	29.4	C	33.8	C	14.6	B
Main Street	Signal	22.4	C	35.5	D		-	43.4	D	33.1	C
I-15 (SPUI)	Signal	22.5	C	20.9	C	33.1	C	25.1	C	24.7	C
Fort Lane	Signal	51.4	D		-	39.5	D	12.7	B	39.9	D

(1) Main Street Alt 1: Widen Gentile Street to 5-Lanes for 500 ft west of Main Street; Add NB dual left turn lanes.
(2) Main Street Alt 2: Widen Main Street to 7-Lanes north and south of Gentile Street.
(3) Sugar/Angel Street: Re-align Sugar Street to connect with Angel Street.

Table 12: Alternative 3C 2030 Intersection Analysis (HCM)
(Gentile Street with 5-Lanes and Full Interchange at Gentile/I-15)
8/24/2007

Intersection	Control	EB		WB		NB		SB		Average Intersection	
		Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
Gentile Street											
2200 West	Signal	7.8	A	10.3	B	12.5	B	12.7	B	10.4	B
1700 West	Signal	7.1	A	9.7	A	17.0	B	17.3	B	11.1	B
Angel Street	Signal	32.4	C	16.1	B	28.6	C	-	-	22.7	C
Sugar Street	Stop	15.2	C	0.0	A	-	-	>100	F	*	*
King Street	Signal	54.4	D	41.2	D	55.6	E	41.1	D	47.6	D
Flint Street	Stop	0.0	A	51.9	F	>100	F	-	-	*	*
Main Street	Signal	66.9	E	112.9	F	74.8	E	117.9	F	98.0	F
I-15 SPUI	Signal	35.3	D	25.8	C	58.5	E	37.6	D	37.4	D
Wasatch Drive	Signal	9.3	A	6.7	A	-	-	53.1	D	12.1	B
Fort Lane	Signal	13.3	B	45.1	D	46.7	D	53.7	D	32.4	C
Main Street ALT 1 (1)	Signal	52.2	D	102.6	F	72.9	E	82.2	F	81.2	F
I-15 SPUI ALT 1 (1)	Signal	31.1	C	14.4	B	51.7	D	44.2	D	31.2	C
Wasatch Drive ALT 1 (1)	Signal	9.5	A	6.1	A	-	-	42.4	D	11.0	B
Fort Lane ALT 1 (1)	Signal	13.1	B	47.6	D	39.6	D	49.6	D	31.5	C
Main Street ALT 2 (2)	Signal	66.9	E	112.9	F	57.1	E	116.1	F	95.5	F
Main Street ALT 3 (3)	Signal	51.2	D	71.9	E	56.6	E	82.8	F	67.6	E
Sugar/Angel Street (4)	Signal	23.1	C	18.4	B	22.1	C	27.8	C	22.1	C
*The HCM does not define intersection-wide delay for two-way stop controlled intersections.											
750 South											
2200 West	Signal	15.0	B	18.0	B	15.5	B	15.1	B	16.2	B
1700 West	Signal	11.0	B	6.0	A		-	10.5	B	8.4	A
Angel Street	Signal	4.3	A	11.4	B	12.1	B	12.6	B	10.1	B
King Street	Signal	20.7	C	21.0	C	38.7	D	34.2	C	31.2	C
Flint Street	Stop	21.5	C	-	-	3.5	A	0.0	A	*	*

(1) Alt 1: Widen Gentile Street to 7-Lanes for 500 ft west of Main Street to Fort Lane; Add triple-lefts at SPUI NB Off-Ramp.
(2) Main Street Alt 2: Widen Main Street to 7-Lanes north and south of Gentile Street.
(3) Main Street Alt 3: Combined Alt 1 and 2 with triple-lefts SB Main Street.
(4) Sugar/Angel Street: Re-align Sugar Street to connect with Angel Street.

Table 13: Alternative 4B 2030 Intersection Analysis (HCM)
(Gentile Street with 5-Lanes and Half Interchange at Gentile/I-15)
8/24/2007

Intersection	Control	EB		WB		NB		SB		Average Intersection	
		Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
Gentile Street											
2200 West	Signal	7.8	A	10.3	B	12.5	B	12.7	B	10.4	B
1700 West	Signal	7.2	A	9.7	A	16.8	B	17.3	B	11.1	B
Angel Street	Signal	34.8	C	17.9	B	28.6	C	-	-	24.6	C
Sugar Street	Stop	14.8	B	0.0	A	-	-	>100	F	*	*
King Street	Signal	32.7	C	50.9	D	67.7	E	58.3	E	60.1	E
Flint Street	Stop	0.0	A	52.6	F	>100	F	-	-	*	*
Main Street	Signal	57.3	E	58.5	E	84.0	F	90.3	F	71.3	E
I-15 SB Off-Ramp	Signal	2.6	A	4.5	A	-	-	20.2	C	7.8	A
I-15 NB On-Ramp	Signal	6.2	A	2.0	A	-	-	-	-	4.2	A
Wasatch Drive	Signal	6.6	A	7.6	A	-	-	50.1	D	11.3	B
Fort Lane	Signal	25.4	C	39.7	D	42.7	D	48.5	D	35.6	D
Main Street ALT1 (1)	Signal	55.5	E	40.1	D	62.6	E	64.6	E	54.7	D
Main Street ALT2 (2)	Signal	52.0	D	33.8	C	70.7	E	78.2	E	57.1	E
Main Street ALT3 (3)	Signal	44.9	D	30.5	C	52.5	D	53.9	D	44.5	D
Sugar/Angel Street (4)	Signal	22.9	C	19.0	B	21.2	C	24.3	C	21.4	C
*The HCM does not define intersection-wide delay for two-way stop controlled intersections.											
750 South											
2200 West	Signal	15.0	B	18.0	B	15.5	B	15.1	B	16.2	B
1700 West	Signal	10.9	B	5.9	A		-	10.5	B	8.3	A
Angel Street	Signal	4.3	A	11.8	B	12.1	B	12.6	B	10.3	B
King Street	Signal	96.1	F	22.2	C	29.7	C	31.8	C	43.9	D
Flint Street	Stop	19.8	C	-	-	3.5	A	0.0	A	*	*

(1) Main Street Alt 1: Add a WB Thru-Lane (3-Lanes WB) on Gentile for 500 ft west of Main Street.
(2) Main Street Alt 2: Widen Main Street to 7-Lanes north and south of Gentile Street.
(3) Main Street Alt 3: Combined Alt 1 and 2.
(4) Sugar/Angel Street: Re-align Sugar Street to connect with Angel Street.

Under the base conditions of Alternative 2G, the intersection of Gentile Street and Main Street operated at LOS E. Two options were analyzed to improve this intersection. The first, Main Street Alt 1, assumed Gentile Street would be widened to five lanes for a distance of 500 ft west of Main Street. This changed the operations to LOS D, but it would require the removal of existing buildings to perform the widening. The second option, Main Street (Alt 2), assumed Main Street would be widened to a seven lane section. This option appears to be feasible without the removal of existing buildings. Also, Main Street (Alt 2) assumed the eastbound approach used a shared thru-right lane to eliminate widening of Gentile Street west of Main Street. If a separate right turn lane could be provided, the traffic operations would be further improved.

Alternative 2G was also analyzed to see if it would function with a five lane section on 750 South between Flint Street and Fort Lane. The analysis indicated that the 750 South intersections would operate at acceptable Levels of Service. Table 9, above, includes the intersection summary results for 750 South with 5 lanes.

Because Alternative 2G functioned with 5 lanes on 750 South, it was decided that 2H and 2I should be screened out, as they did not provide any significant improvement in LOS and would be a much higher cost than 2G. It was also decided to screen out 3C based on purpose and need at the intersection of Gentile Street and Main Street, because

the intersection and/or certain legs would operate at LOS F even with Transportation System Management (TSM) improvements.

Alternative 2F was screened out because of poor traffic operations with the 5 lane section on 750 South. The intersections on 750 South at Flint Street and Main Street have 3 legs that operate at LOS E as shown in Table 8, above. These same locations operate at LOS D or better under Alternative 2G with the 5 lane section on 750 South.

Alternative 4B operated at LOS E at the intersection of Gentile Street and King Street, but it had no legs at LOS F. Also the Gentile Street legs (EB and WB) were at LOS D or better, so this alternative was carried forward to the environmental screening process as an additional option to 2G.

Under each alternative, the intersection of Gentile Street and Flint Street is shown to operate at LOS F in the northbound approach. This Level of Service is caused by the NB to WB left turn movement. Although the intersection may warrant a signal in the future, the spacing is too close to the King Street signal. Also, a signal at Flint Street may attract additional traffic to Flint Street and necessitate its widening, which Layton City has expressed is not desirable. Vehicles needing to make this left turn movement do have the option to go to King Street where a signal is provided.

In the roadway capacity analysis for the first screening, the section on Gentile between Angel Street and Sugar Street had a poor level of service under all alternatives. This was due to the close spacing of the intersections and a large amount of turning movements in that area. The intersection LOS analysis indicated that the southbound leg of Sugar Street would operate at LOS F for each alternative. Signalizing Sugar Street was deemed not feasible, because of the close spacing to Angel Street which is already signalized. However, both Angel Street and Sugar Street are "T" intersections and Sugar Street could be realigned to create a single intersection at Angle Street. This concept was analyzed and was shown to operate at LOS "B". The Sugar/Angel Street and other analysis results are shown in Tables 8-13.

750 South I-15 Interchange Configuration

Because of the close spacing between Main Street and the Milepost #330 Interchange for Alternatives 2G and 2F, the interchange was analyzed using the configuration of a Single Point Urban Interchange (SPUI) for the base condition. In addition to this, a compressed, or tight diamond configuration was analyzed for 2G with both the 7 lane and the 5 lane 750 South options. The results are shown in Table 9, above, options (4), (5) and (6). The analysis indicated the intersections would operate at acceptable LOS; however, HCM methodology does not fully take into account the close spacing of the diamond intersections and the friction created with the weaving that would occur.

To account for the friction and weaving between closely spaced intersections, the 750 South 5 lane option from Flint Street to Fort Lane was analyzed using the SimTraffic simulation model. The results show that the SPUI configuration would have less total

delay, and that the delay per vehicle is also less for the total network than the compressed diamond. It is recommended that the SPUI interchange configuration be used in conjunction with Alternative 2G. The summary of the SimTraffic results is shown in Exhibit 14, below.

Table 14: Alternative 2G 2030 Interchange Comparison

SimTraffic Report

	Control	Main St			I-15			Fort Lane			Total Network	
		Delay		LOS	Delay		LOS	Delay		LOS	Delay	
		Total (hr)	per Veh (s)		Total (hr)	per Veh (s)		Total (hr)	per Veh (s)		Total (hr)	per Veh (s)
SPUI	Signal	42.5	28.6	C	35.9	33.4	C	15.2	18.2	B	134.8	71.2
Diamond	Signal	43.1	29.1	C	70.7	54.8	D	14.4	17.2	B	160.2	85.2

TSM AND TRANSIT ONLY ALTERNATIVE

Transportation System Management (TSM) is a means of improving traffic operations through spot improvement projects. These include items such as traffic signal coordination, intersection widening, and access management measures. Any alternative selection will require an analysis of TSM measures that would reduce delay at spot locations by providing some operational improvements. These improvements will not reduce the demand volume, but would increase the capacity of a specific intersection to some degree. TSM measures alone are expected to improve the overall capacity of Gentile Street by approximately 5 to 10 percent which is less than the projected 2030 travel demand increase of over 50 percent. TSM alone will not eliminate the need for an overall system improvement in order to meet the purpose and need.

Future transit improvements are included in the WFRC travel demand model (bus, light rail, and commuter rail services) which account for an approximately 3 percent of the total trips. If additional transit improvements were included in the model that resulted in doubling the transit benefit, it would not eliminate the need for an overall system improvement. Even combined, TSM and a doubling of Transit would only improve the capacity of Gentile Street by up to 16 percent, which is still below the projected 2030 travel demand increase.

CONCLUSION

Based on the traffic operation analysis, two alternatives should be carried forward to the next screening level of the EIS. These include Alternative 2G and Alternative 4B. Alternative 2G includes a new SPUI interchange at I-15 Milepost #330 with 5 lanes on 750 South between Flint Street and Fort Lane. Alternative 4B includes a half interchange at Gentile Street and I-15 to accommodate traffic movements to and from the north, and widening Gentile Street to 5 lanes from Main Street to Angel Street. Schematic drawings of the intersection lane geometry for both alternatives are included in Appendix E.

APPENDIX A

Socio-Economic Demographic Update

To: Jim Horrocks, P.E.
Michael (Kaz) Kaczorowski, UDOT

From: Connie Douglas, E.I.T.
Ron Mortimer, T.E.
Mack Christensen, P.E.

Date: February 15, 2007 **Memorandum**

Subject: **Travel Demand Modeling and Traffic Volume Forecasting Methodologies for the Layton I-15 Interchange EIS Project**

Introduction

The Wasatch Front Regional Council (WFRC) Conformity Travel Demand Model version 4.3 was used in projecting estimated 2030 traffic volumes/demand throughout the study area for the Layton I-15 Interchange Environmental Impact Statement (EIS) project. The following paragraphs document the processes used to obtain new Davis County demographic data to use in the existing (2005/6) and 2030 travel models, the steps taken in calibrating and validating the model results, and the process in using the 2030 projected travel demand volumes to obtain reliable 2030 forecast traffic volumes.

Background

In June 2006, Horrocks Engineers began the travel demand modeling process for this project by running an existing 2005/6 travel demand model and a future 2030 demand model. The 2005/6 travel demand model results showed daily travel demand volumes on several roadways in the study area lower than existing traffic count data collected in March 2006. The 2030 travel demand model results were closer to existing traffic data volumes, especially on 200 North. With much growth anticipated in the Syracuse, Layton and Kaysville areas, especially west of I-15 in the project study area, these discrepancies in the travel demand models indicated the need for additional work to improve the travel demand model results.

Model Validation

Horrocks Engineers met with WFRC and UDOT on June 14, 2006, to further review the 2005/6 and projected 2030 daily travel demand volumes from the initial travel demand modeling performed. WFRC and UDOT requested that Horrocks review the total travel

demand growth through the study area through a post processor screen-line adjustor. Checks were also performed with the travel demand models to ensure that the demographic data in the traffic analysis zones (TAZ's) was being regenerated into the correct type of trips and that the trips produced in each TAZ matched the trips assigned through the travel demand model distribution process. After continued evaluation, the post processor screen-line adjustor results and the results of the review of the TAZ trips and distribution processes indicated that the travel demand model was working properly and the growth occurring throughout the study area was considered reasonable. However, the daily travel demand volumes on 200 North and several other roadways in the 2030 model were still closer to existing daily traffic count volumes, not the anticipated volumes the Cities were projecting in their Transportation Master Plans. Horrocks, UDOT, and WFRC concluded that further evaluation of the demographic data for the TAZ's for the cities of Layton, Syracuse, and Kaysville within the project study area was warranted.

Model Demographic Data Updates

Horrocks Engineers met with the cities of Syracuse and Layton on June 30, 2006, and with Kaysville City on July 7, 2006, to review the demographic data assigned to the TAZ's that were in their city boundaries. The results of the two meetings were that all three cities felt they had substantial growth occurring in several TAZ's that was not reflected in the demographic data assigned to that zone. Syracuse City offered to send GIS shape files to Horrocks for further review of existing and future land use plans. Layton City agreed to review their GIS files, update each TAZ accordingly, and resubmit the data to Horrocks (received August 30, 2006). In the meeting with Kaysville City, Horrocks received verbal changes to two TAZ's west of I-15, TAZ 257 and 258, with instructions that the remaining city TAZ's demographic data was about what the City had presently or was expected to have by the year 2030. The changes to TAZ 257 and 258 included new population and household values.

After obtaining Syracuse City GIS land use shape files, Horrocks staff re-calculated growth for Syracuse City by merging each WFRC TAZ GIS shape file with the City GIS files and holding the City anticipated 2030 population and household total values. The process of evaluating the GIS files included the following assumptions:

- 45% of non-residential areas were buildable, and the remaining 55% was assigned as open space, roadway infrastructure, and parking lot or other type facilities.
- 43% of residential areas were buildable, based on lot size and estimated total number of units made by Syracuse City. The remaining 57% of the total area

assigned to the residential land use was assumed open space (yard), roadway infrastructure, and other type facilities.

- Large agriculture areas of greater than one (1) acre were assigned one (1) single-family household and two (2) employees.

After applying the assumptions to each piece of land use with the City GIS shape files, the amount of land available for building construction was calculated. It was assumed that large parcels of Agricultural property had one or two homes built on them, but primarily the property consisted of farmland and/or fields. Commercial property was assumed to have 19 employees per acre and industrial land uses with 10 employees per acre. Residential land uses were assumed based on Syracuse City standards with zone R-1 having 2.90 dwellings per net acre, R-2 with 3.79 dwellings per net acre, R-3 with 5.44 dwellings per net acre, and R-4 with 14.52 dwellings per net acre. These factors were applied to each piece of land use as they were divided into the different TAZ's with the combined GIS shape files. The factors were used to adjust the household and population values to match Syracuse planning department values of 5,586 households at approximately 3.8 persons per household for a total population of about 21,225 persons for the year 2006. Applying the same factors to again match Syracuse City projections, the estimated households would be about 10,283 for the year 2030. Multiplying the households by about 3,89 persons per household, the 2030 population for Syracuse City was estimated at about 40,000 persons. The employment values for each TAZ were then estimated based on the City projected data and applied to each TAZ with the same proportions as the WFRC demographic data sets used.

The revised demographic data for the three cities (see Appendix A) was then input into the corresponding demographic data files from WFRC. Horrocks re-calculated each Davis County TAZ total while updating the new TAZ totals and holding the Governor's Office of Planning and Budget (GOPB) population and employment totals that WFRC uses with their corresponding Conformity models. The 2005/6 and 2030 travel demand models were run again with the new TAZ demographic values for Davis County. The results of the 2005/6 travel demand model with the new demographic data illustrated that daily travel demand volumes on 200 North were more reasonable when compared with existing traffic data counts. The new 2030 travel demand model results were reasonable compared to WFRC and City anticipated projected daily traffic volumes based on the total growth projected to occur for Davis County as a whole as well as for the individual cities.

Horrocks met with WFRC and UDOT on September 6, 2006, to present the results of the revised 2005/6 and 2030 travel demand daily travel demand volumes using the new demographic data values in Davis County. However, WFRC still had concerns that while Horrocks held the GOPB County totals, the City GOPB totals needed to be held as

well. WFRC manager, Ned Hacker, requested that the new demographic data files be sent to Scott Festin, also with WFRC, for final review as Scott had been recently updating the 2005 demographic data for the travel demand model files.

Horrocks received final 2005/6 and 2030 demographic data for Davis County from Scott Festin at WFRC on September 12, 2006 (see Appendix B). Scott adjusted the demographic data files for the TAZ's in Davis County holding both City and County 2005/6 and 2030 GOPB control totals. The new TAZ demographic data was then re-entered into the 2005/6 and 2030 travel demand models, making sure that the new household numbers were adjusted. The household adjustments are necessary with the modeling process and determine the breakdown of how many persons per household are for the homes in each TAZ. This household adjustment is done with the WFRC travel demand model through an internal processor called Gliebe. The Gliebe program must be used to update the persons per household in each TAZ prior to running the new demographic data. If the processor is not used, the trip generation process for the model will continue to use the household values previously determined with the last Gliebe process, hence the household information will not really be updated in the model. Updating the household persons distribution with the Gliebe process then determines how many vehicle trips are assigned to each type household through the auto-ownership assignment in the modeling process, thus making a significant impact on the demand volumes produced.

After adjusting the household demographic data with the Gliebe processor, the 2005/6 and 2030 travel demand models were again run for further evaluation. The results of the new travel demand volumes were similar to the previous runs with the Horrocks adjusted demographic data sets before the data had been reviewed by WFRC. Thus, the new 2005/6 and 2030 demographic data files sent by Scott Festin at WFRC will be used in the modeling for the alternatives evaluation process for this project.

Off-Model Adjustments

Once the travel demand models were validated, it was necessary to convert the travel demand volumes into average daily traffic forecast volumes. As the model validation process had derived reasonable trip generation results, Horrocks decided the travel demand growth between the 2005/6 and 2030 models would provide an accurate measure for projecting the increase in daily traffic volumes for the year 2030. Horrocks used the growth calculated between the 2005/6 and 2030 travel demand model volumes and added to existing traffic counts collected for the project to estimate projected 2030 traffic volumes. With many new roadways planned throughout the study area on the west side of I-15, each roadway was evaluated separately and as part of the regional

roadway network in both the 2005/6 and 2030 models. The total growth occurring throughout the study area on similar type roadways was calculated between the two models and off-model adjustments made to re-distribute the growth in travel trips back onto new roadways not in the 2005/6 model. Each individual roadway was evaluated for its type, function, and connectivity to other existing and/or new roadways before off-model volume adjustments were used to estimate the projected 2030 daily traffic volumes for that roadway. It is important with the off-model adjustment process that travel demand model volumes are not taken and applied to the roadway directly as a traffic volume, rather the demand volumes are used strictly in estimating trip growth factors that are applied to existing traffic counts to determine projected future traffic volumes.

Forecast Daily Traffic Volumes for I-15

With new roadway improvements from the Wasatch Front Regional Long Range Plan incorporated into the travel demand model, it is difficult to project for this project 2030 daily traffic volumes on the principal roadways of I-15, the new Legacy Parkway, and the new grade separated US-89 corridor as these roadways are considered to have the same function, servicing faster and longer north-south regional travel demand trips between Weber, Davis and Salt Lake Counties. Thus, while the total north-south travel demand growth in the model is accounted for, the distribution of that demand on the three roadways in the model may not always appear reasonable for smaller, sub-regional projects such as this. However, WFRC, having studied these principal roadways in greater detail, has published projections for the I-15, Legacy, and US-89 corridors based on the function of the corridors and the available travel demand throughout the Davis County region based on existing and projected City growth. Presently, WFRC is estimating that in 2030 the I-15 corridor throughout the project study are will serve about 130,000 to 150,000 vehicles per day (vpd), the new Legacy corridor approximately 22,000 to 30,000 vpd, and the US-89 corridor approximately 67,000 to 83,000 vpd (see Appendix C). These volume ranges have been found to be consistent with the projected travel demand volumes from the Horrocks 2030 travel demand model volumes using the new demographic data sets provided by Scott Festin at WFRC. Therefore, the WFRC projected 2030 traffic volume ranges for the I-15, Legacy and US-89 corridors will be used in the alternatives modeling process for this project.

Peer Review Submittal

It has been agreed upon by all parties and authorities with this Layton I-15 Interchange EIS project that Horrocks Engineers is to submit all of the 2005/6 and 2030 travel demand model data and results to the UDOT Planning department for a final peer review. This memorandum is provided to document the methodologies used by Horrocks and the modeling findings that will be carried forward through the alternatives evaluation process for this project, as well as to document the formal submittal of the traffic data for this project to UDOT. With many environmental studies

becoming larger projects for UDOT and engineering consultants, travel demand modeling is becoming a widely recognized tool in evaluating existing and future impacts in regional travel patterns. It would be desirable for WFRC to adopt and incorporate the final demographic data sets from this project into their conformity travel demand model for UDOT and consultants to use on future projects.

Please let us know if you have any questions or concerns.

Cc: file

Charles Mace, UDOT Region One Project Manager

Walt Steinvorth, UDOT Program Development

Greg Punske, FHWA

Eric Rasband, UDOT Planning

Ned Hacker, WFRC

Muhammad Faran, WFRC

APPENDIX B

Initial WFRC Travel Demand Model Results

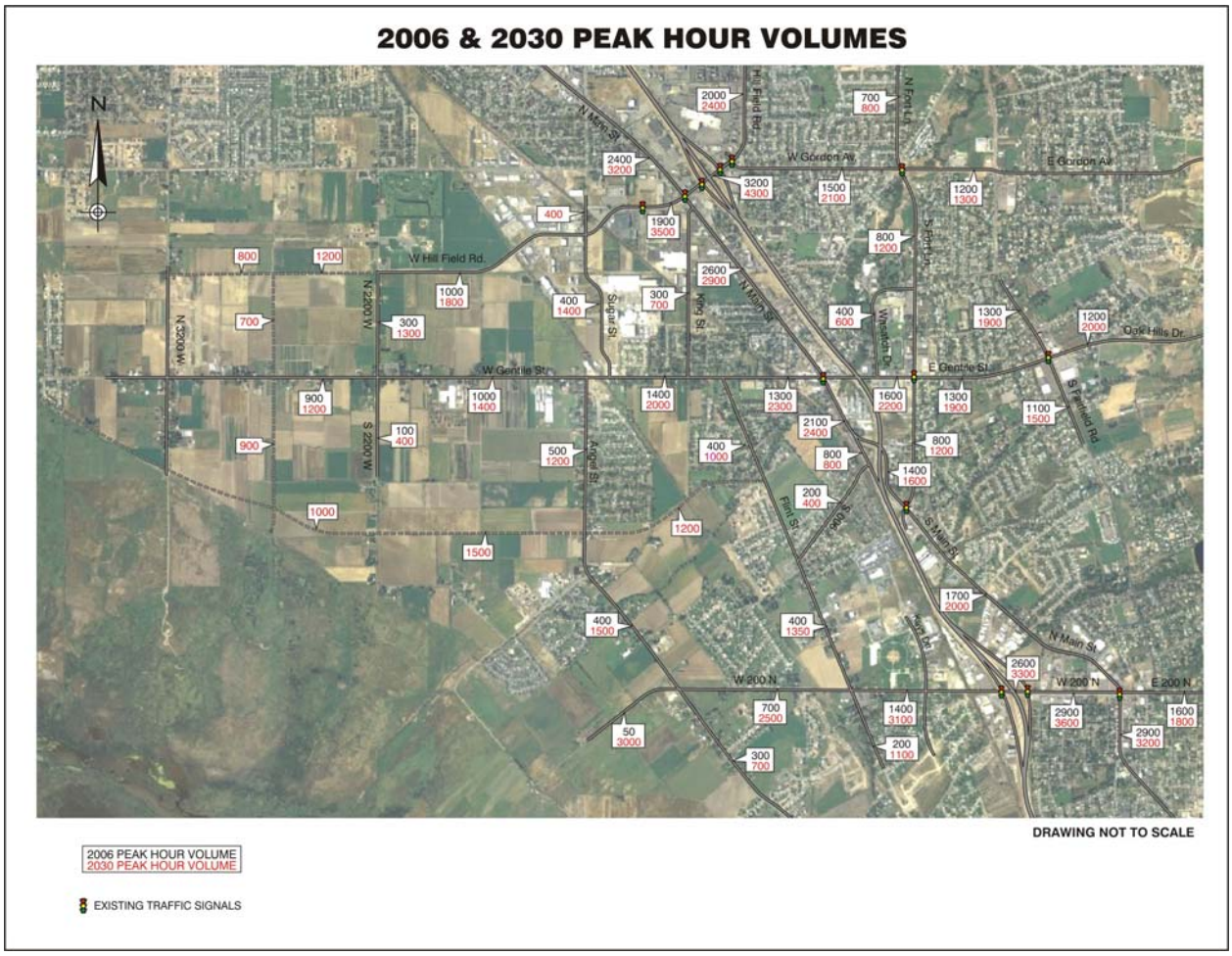

Figure B-1: 2006 & 2030 Peak Hour Volumes
Note: 2030 Volumes from the Initial Run of the WFRC Travel Demand Model

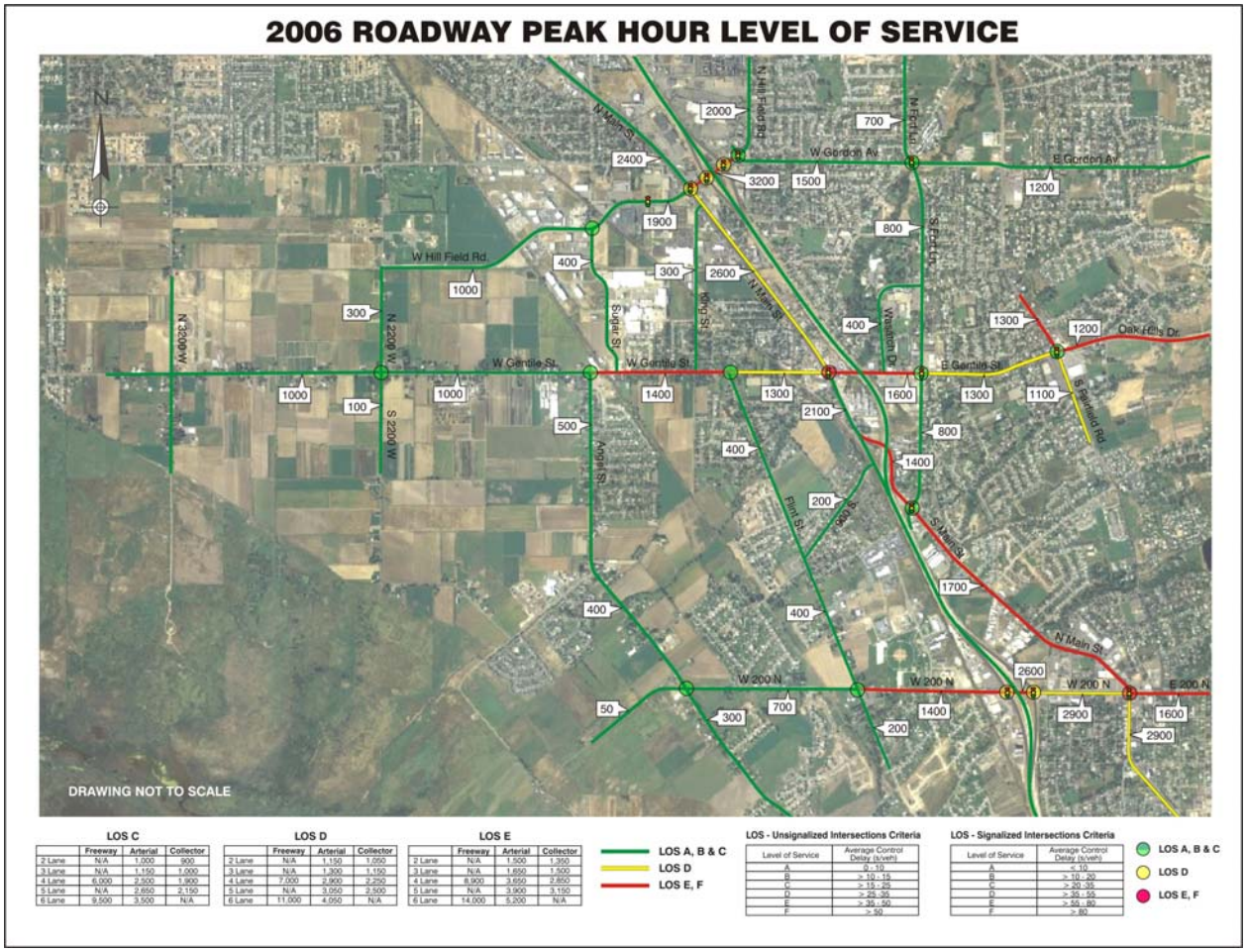

Figure B-2: 2006 Roadway Peak Hour Level of Service

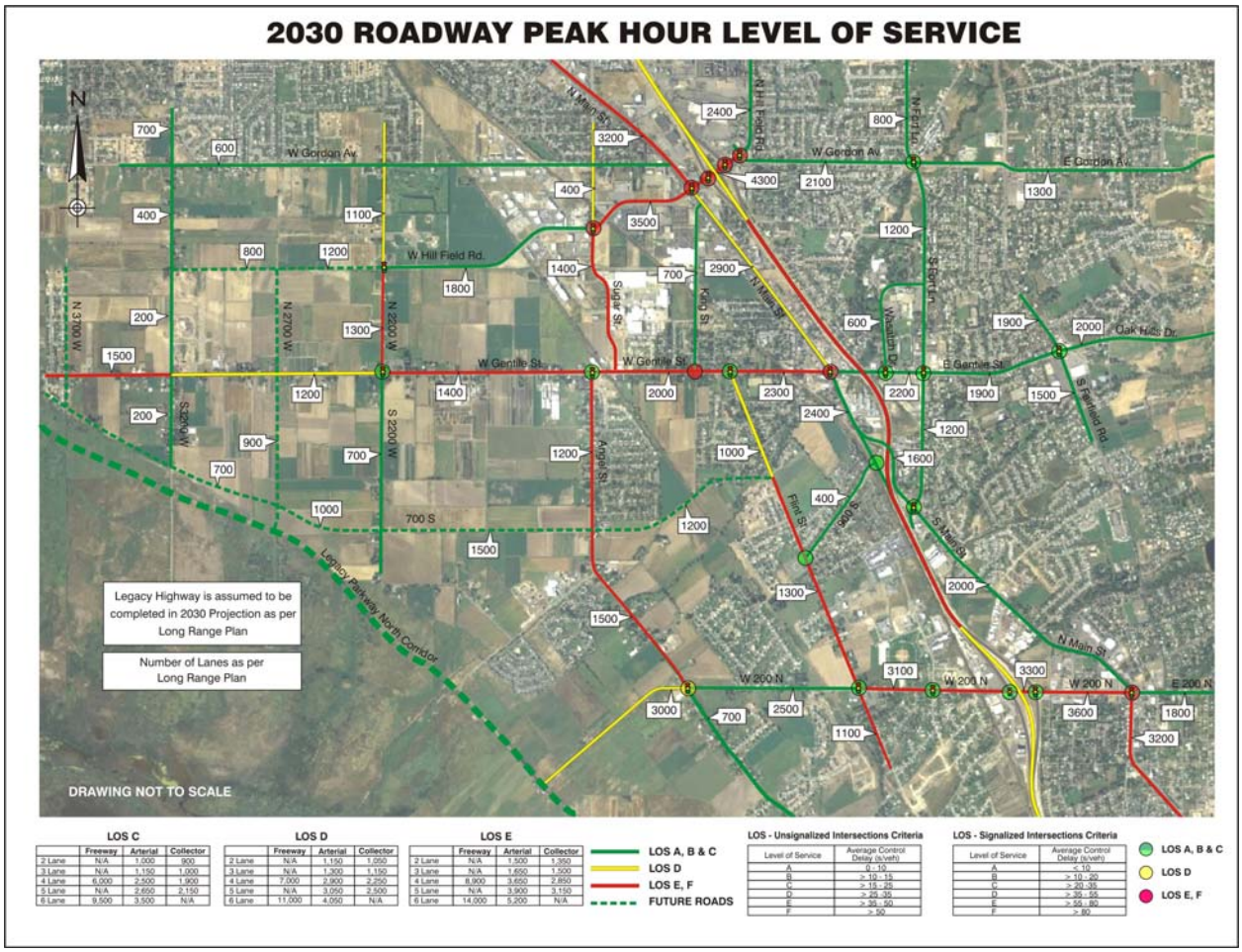

Figure B-3: 2030 Roadway Peak Hour Level of Service
Note: 2030 Volumes from the Initial Run of the WFRC Travel Demand Model

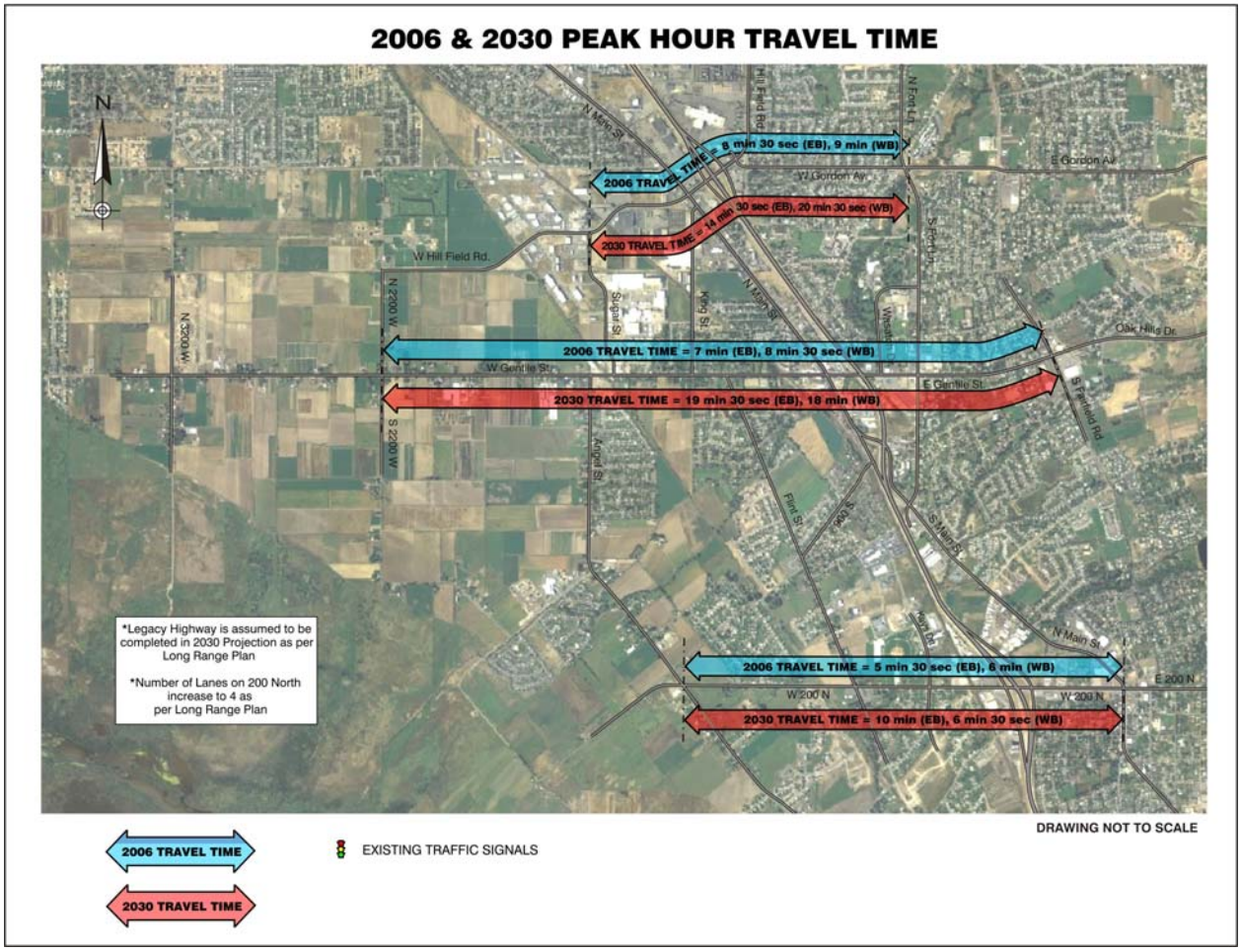

Figure B-4: 2006 & 2030 Peak Hour Travel Time
Note: 2030 Volumes from the Initial Run of the WFRC Travel Demand Model

Table B-1: Traffic Operations Summary

	Corridor Volumes and Level of Service						
	Traffic Volumes						
	Peak Hour		Functional	Number of Lanes		Level of Service	
	Year 2006	Year 2030	Classification	Year2006	Year 2030	Year 2006	Year 2030
East West Streets							
Hill Field Rd - 2200 West to Sugar St.	1000	1800	Arterial	5	5	B	B
Hill Field Rd - Sugar St. to Main St.	1900	3500	Arterial	5	5	B	E
Hill Field Rd interchange area	3200	4300	Arterial	5	5	E	F
North Hill Field Rd	2000	2400	Arterial	5	5	B	C
Gordon Ave.- Hill Field Rd to Fort Lane	1500	2100	Arterial	5	5	B	C
Gordon Ave. - Fort Lane to Fairfield Rd	1200	1300	Arterial	2	5	A	A
Gentile - 2200 West to Angel St.	1000	1400	Arterial	2	3	C	E
Gentile - Angel St to Flint St.	1400	2000	Arterial	2	3	E	F
Gentile - Flint St to Main St.	1300	2300	Arterial	2	3	D	F
Gentile - Main St. to Fort Lane	1600	2200	Arterial	3	5	F	C
Gentile - Fort Lane to Fairfield Rd	1300	1900	Arterial	3	5	D	B
Gentile - East of Fairfield Rd	1200	2000	Arterial	2	5	E	B
900 South - Flint St. to Main St.	200	400	Collector	2	2	A	A
200 North - 2200 West to Angel St.	50	3000	Arterial	2	5	A	D
200 North - Angel St to Flint St.	700	2500	Arterial	2	5	B	C
200 North - Flint St to I-15	1400	3100	Arterial	3	5	E	E
200 North Interchange area	2600	3300	Arterial	5	5	C	E
200 North - I-15 to Main St.	2900	3600	Arterial	5	5	D	E
200 North - Main St to Fairfield Rd.	1600	1800	Arterial	3	5	F	B
North South Streets							
2200 West - Hill Field Rd to Gentile	300	1300	Collector	2	2	A	E
2200 West - Gentile to 700 South	100	700	Collector	2	2	A	C
Angel St.- Gentile to 700 South	400	1200	Collector	2	2	A	E
Angel St.- 700 South to 200 North	400	1500	Collector	2	2	A	E
Angel St. - South of 200 North	300	700	Collector	2	2	A	B
Sugar St. - Hill Field Rd to Gentile St	300	1400	Collector	2	2	A	E
King St. - Gentile St. to Main St.	300	700	Collector	2	2	A	B
Flint St - Gentile to 900 South	400	1000	Collector	2	2	A	D
Flint St - 900 South to 200 North	400	1300	Collector	2	2	A	E
Flint St south of 200 No	200	1100	Collector	2	2	A	E
Main Street - Antelope Dr to Hill Field Rd	2400	3200	Arterial	5	5	C	E
Main Street - Hill field Rd to Gentile St	2600	2900	Arterial	5	5	C	D
Main Street - Gentile St to I-15	2100	2400	Arterial	5	5	C	C
Main Street - I-15 to Fort Lane	1400	1600	Arterial	2	5	E	B
Main Street - Fort Lane to 200 North	1700	2000	Arterial	2	5	F	B
Main Street South of 200 No	2900	3200	Arterial	5	5	D	E
Wasatch Drive - Gentile St. to Fort Lane	400	600	Collector	3	3	A	B
Fort Lane North of Gordon Av	700	800	Collector	3	3	B	C
Fort Lane -Gordon Ave. to Gentile St	800	1200	Collector	3	5	C	A
Fort Lane - Gentile St to Main St.	800	1200	Collector	3	5	C	A
Fairfield Rd North of Gentile St.	1300	1900	Collector	3	5	E	C
Fairfield Rd South of Gentile St.	1100	1500	Collector	3	5	D	B

Note: 2030 Volumes from the Initial Run of the WFRC Travel Demand Model

Table B-2: Traffic Operations Volume Summary

Intersection Traffic Volumes (DHV)

	Year 2006												Year 2030											
	EB			WB			NB			SB			EB			WB			NB			SB		
Intersections	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt
Hill Field Rd & Sugar St	2	399	33	146	484	4	44	0	48	15	0	12	30	420	60	600	490	100	60	40	640	175	20	600
Hill Field Rd & Main St	157	660	156	497	681	455	136	572	471	310	783	117	360	1200	250	450	1220	590	220	660	440	420	920	270
Hill Field Rd & SB Ramp	0	1245	209	306	1261	0	0	0	0	341	0	387	0	1650	240	460	1680	0	0	0	0	510	0	440
Hill Field Rd & NB Ramp	353	1214	0	0	1245	344	351	0	333	0	0	0	400	1750	0	0	1800	400	350	0	350	0	0	0
Hill Field Rd & Gordon Ave	289	749	475	240	845	37	408	134	150	6	96	248	350	950	860	200	1100	20	750	100	120	10	70	290
Gordon Ave & Fort Lane	84	540	149	22	451	79	172	170	7	45	170	98	120	640	340	30	540	70	360	240	50	30	230	120
Gentile St. & 2200 West	22	273	9	9	509	96	23	11	5	60	17	37	150	280	20	20	480	400	60	130	20	250	170	220
Gentile St. & Angel St.		376	0	275	585		48		189					460	70	420	790		90		340			
Gentile St. & King St.	51	513		745	72					76		116	100	630			1160	100				130		200
Gentile St. & Flint St.		413	91	117	663	125		111						610	150	330	1050		210		320			
Gentile St. & Main St.	99	273	191	149	333	344	322	671	95	383	688	42	300	500	280	92	650	450	490	700	60	520	790	150
Gentile St. & Wasatch	72	686			649	90				95		166	100	920			985	100				120		200
Gentile St & Fort Lane	84	519	55	44	460	78	91	288	141	90	174	96	170	810	120	50	710	80	200	420	160	90	260	190
Gentile St. & Fairfield Rd.	167	337	86	113	301	135	140	323	106	148	344	160	250	600	110	180	540	250	180	430	170	280	450	240
Fort Lane & Main St.	13	386	0	0	481	192	491	279	88	210	0	27	20	490	0	0	660	400	450	390	150	380	0	30
900 So. & Main St.	0	99	10	0	0	0	0	0	0	0	461	151	0	130	50	0	0	0	0	0	0	0	750	150
900 So. & Flint Dr.	23		55					225	50	30	107					50		75		250	50	50	180	
200 North & Angel St.	7	6	0	78	13	158	1	49	76	90	62	2	400	670	290	40	1120	80	320	20	30	200	40	310
200 North & Flint St.	6	240	20	36	430	165	23	14	20	120	17	0	20	650	110	430	1100	670	140	80	290	270	80	50
200 North & Kays Dr.	6	370	3	100	600	100	13	0	76	200	0	18	50	1120	40	100	1400	100	100	0	130	250	20	200
200 North & SB Ramp	0	670	133	230	770	0	0	0	0	936	0	185	0	1230	270	130	1170	0	0	0	0	770	0	430
200 North & NB Ramp	257	1357	0	0	680	555	338	0	519	0	0	0	330	1670	0	0	880	570	420	0	480	0	0	0
200 North & Main St.	144	420	764	222	381	160	505	563	275	180	606	50	380	620	1050	100	600	150	800	520	140	190	600	160

Note: 2030 Volumes from the Initial Run of the WFRC Travel Demand Model

Table B-3: Traffic Operations Summary

	Intersection Level of Service Analysis Results																							
	Year 2006												Year 2030											
	EB		WB		NB		SB		Average				EB		WB		NB		SB		Average			
Intersection	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	V/C	LOS		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	V/C	LOS	
Hill Field Rd & Sugar St	0.0	A	2.0	A	25.4	D	23.0	C	24.3	0.35	C		57.9	E	162.4	F	17.1	B	18.4	B	77.3	0.96	E	
Hill Field Rd & Main St	51.3	D	31.3	C	53.8	D	44.3	D	43.6	0.87	D		106.7	F	154.7	F	162.9	F	130.9	F	138.4	1.19	F	
Hill Field Rd & SB Ramp	25.3	C	13.3	B			44.7	D	24.1	0.84	C		105.4	F	38.9	D			128.8	F	81.3	1.18	F	
Hill Field Rd & NB Ramp	17.4	B	44.7	D	41.8	D			33.0	0.84	C		17.9	B	74.4	E	110.7	F			55.4	1.06	E	
Hill Field Rd & Gordon Ave	19.8	B	33.2	C	23.7	C	50.5	D	27.6	0.70	C		50.4	D	55.3	E	76.3	E	54.7	D	57.3	0.95	E	
Gordon Ave & Fort Lane	32.2	C	31.5	C	12.0	B	10.9	B	25.1	0.40	C		15.1	B	11.5	B	14.7	B	7.9	A	13.2	0.75	B	
Gentile St. & 2200 West	0.9	A	0.2	A	26.0	D	29.9	D	28.9	0.49	D		9.7	A	9.3	A	9.3	A	10.9	B	9.8	0.63	A	
Gentile St. & Angel St.	0.0	A	3.0	A	37.3	E			37.3	0.49	E		21.4	C	11.1	B	19.4	B			15.3	0.65	B	
Gentile St. & King St.	1.9	A	0.0	A			51.2	F	51.2	0.81	F		28.7	D	0.0	A			900+	F	1431.3	1.23	F	
Gentile St. & Flint St.	0.0	A	1.4	A	103.4	F			103.4	0.51	F		23.0	C	22.4	C	24.3	C			22.9	0.84	C	
Gentile St. & Main St.	31.0	C	66.9	E	64.7	E	57.6	E	57.7	0.99	E		145.8	F	51.0	D	150.3	F	154.3	F	126.7	1.34	F	
Gentile St. & Wasatch	15.8	B	13.5	B			11.5	B	14.2	0.55	B		9.0	A	16.7	B			36.6	D	16.1	0.46	B	
Gentile St & Fort Lane	14.3	B	12.9	B	10.3	B	10.4	B	12.3	0.54	B		38.7	D	33.5	C	19.1	B	17.2	B	29.1	0.68	C	
Gentile St. & Fairfield Rd.	12.8	B	10.5	B	9.4	A	9.5	A	10.5	0.55	B		22.6	C	19.4	B	19.1	B	24.5	C	21.5	0.76	C	
Fort Lane & Main St.	12.4	B	13.5	B	14.3	B	14.3	B	13.7	0.72	B		17.8	B	19.1	B	18.5	B	19.5	B	18.7	0.73	B	
900 So. & Main St.	15.0	B	0.0				0.0	A	15.0	0.37	B		31.0	D					0.0	A	5.2	0.56	B	
900 So. & Flint Dr.	10.6	B			0.0	A	1.9	A	10.6	0.36	B		12.0	B			0.0	A	2.1	A	3.0	0.42	A	
200 North & Angel St.	14.3	B	12.4	B	0.1	A	4.7	A	12.5	0.42	B		35.5	D	38.0	D	41.6	D	32.9	C	36.6	0.97	D	
200 North & Flint St.	0.2	A	0.5	A	18.3	C	36.8	E	31.4	0.51	D		42.2	D	16.5	B	47.8	D	35.5	D	27.7	0.71	C	
200 North & Kays Dr.	0.1	A	1.1	A	17.0	C	737.7	F	150.0	69.80	F		12.7	B	24.7	C	35.2	D	53.0	D	25.0	0.82	C	
200 North & SB Ramp	19.8	B	8.8	A			37.7	D	22.9	0.77	C		26.9	C	12.0	B			45.3	D	27.6	0.82	C	
200 North & NB Ramp	16.7	B	22.6	C	31.0	C			22.0	0.87	C		23.8	C	24.4	C	42.0	D			27.8	0.96	C	
200 North & Main St.	70.5	E	59.5	E	51.3	D	54.7	D	59.4	1.03	E		131.8	F	49.8	D	116.6	F	122.3	F	112.8	1.23	F	

Note: 2030 Volumes from the Initial Run of the WFRC Travel Demand Model

APPENDIX C

Final WFRC Travel Demand Model Results

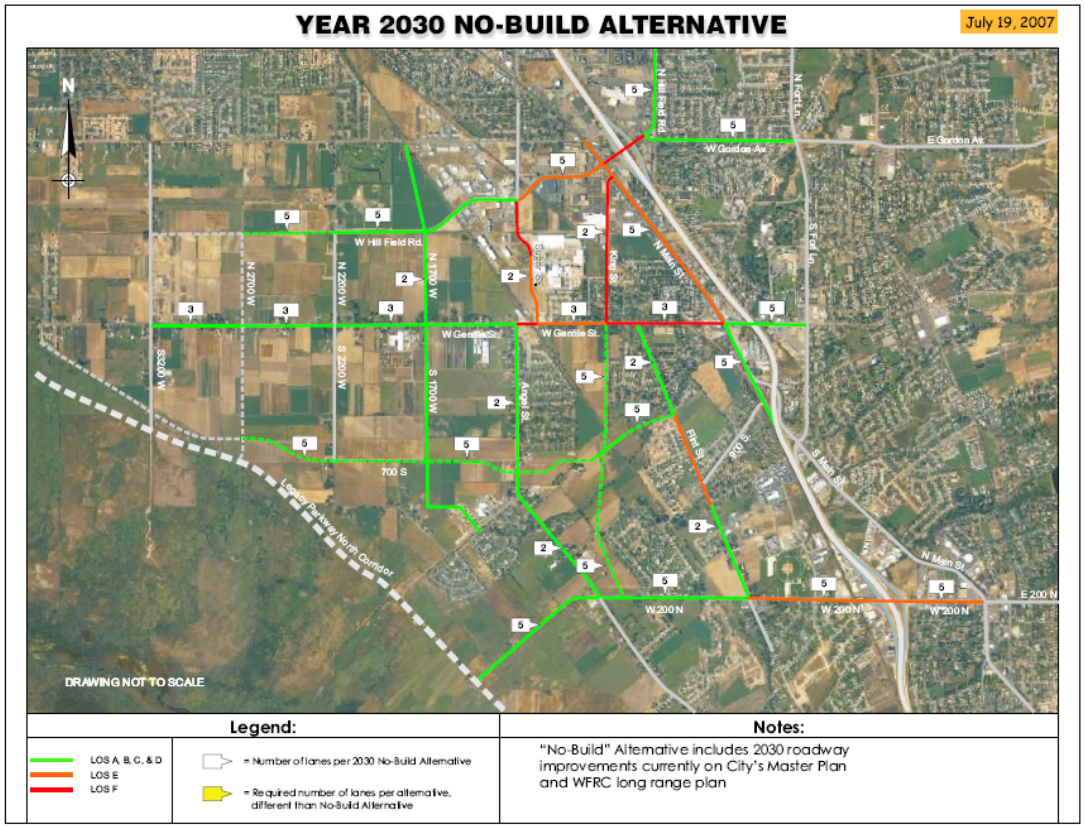

Figure C-1: Year 2030 No-Build Alternative

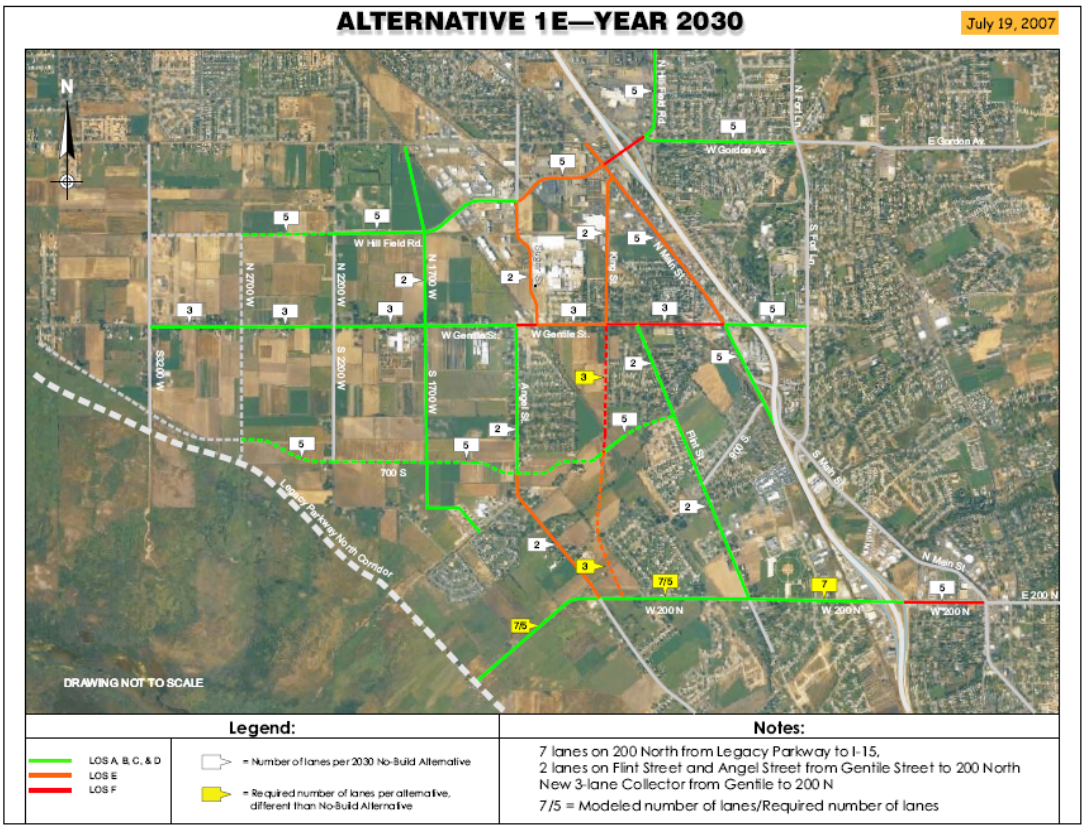

Figure C-2: Alternative 1E-Year 2030

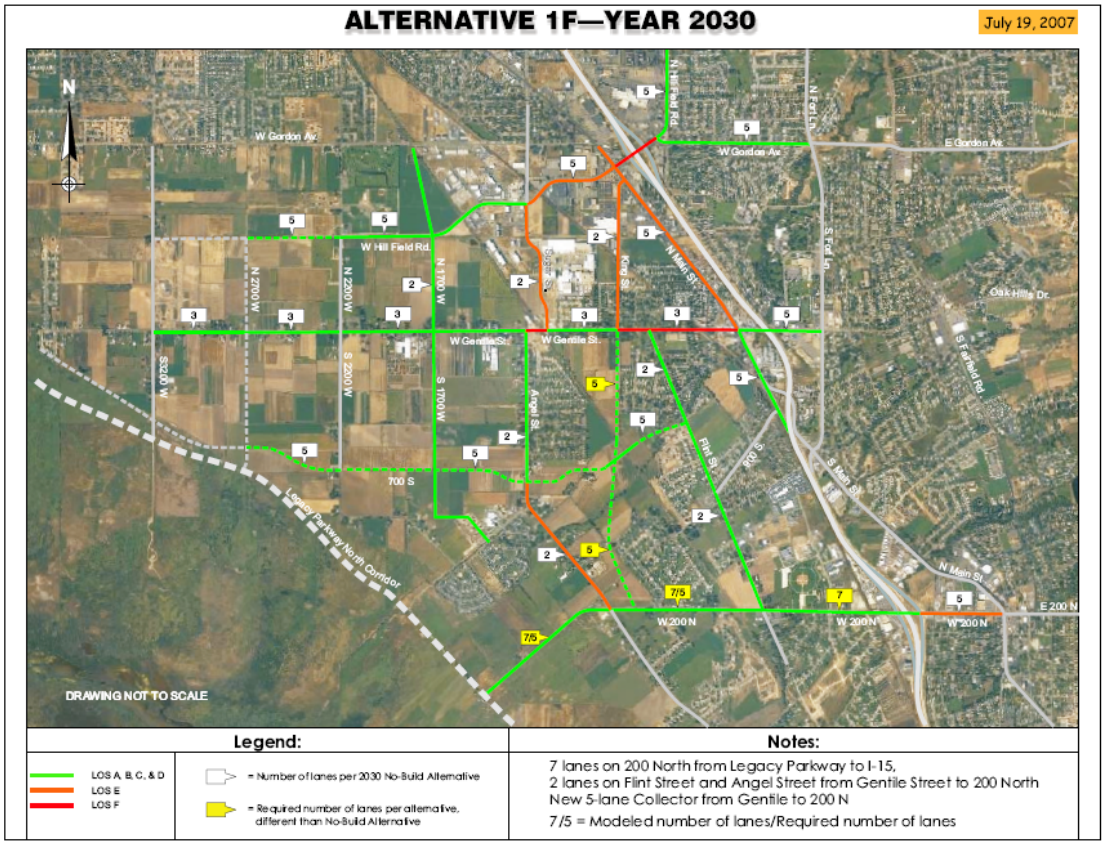

Figure C-3: Alternative 1F-Year 2030

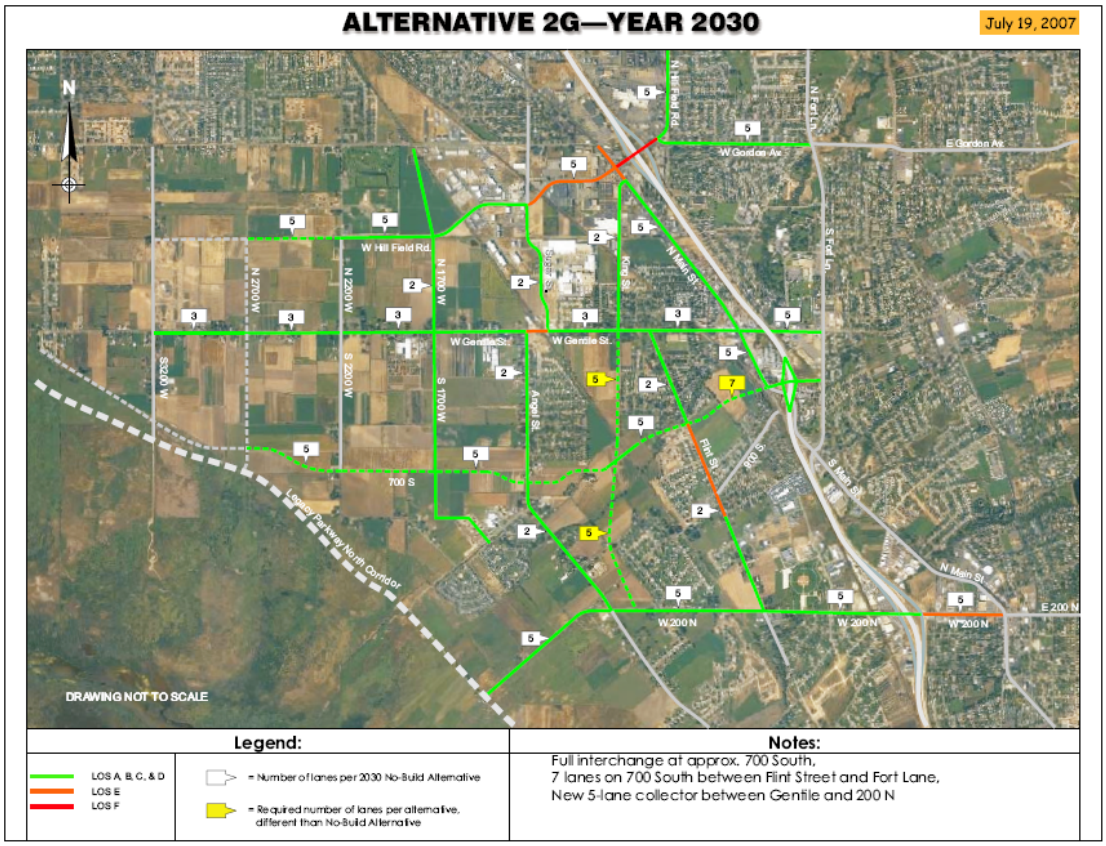

Figure C-4: Alternative 2G-Year 2030

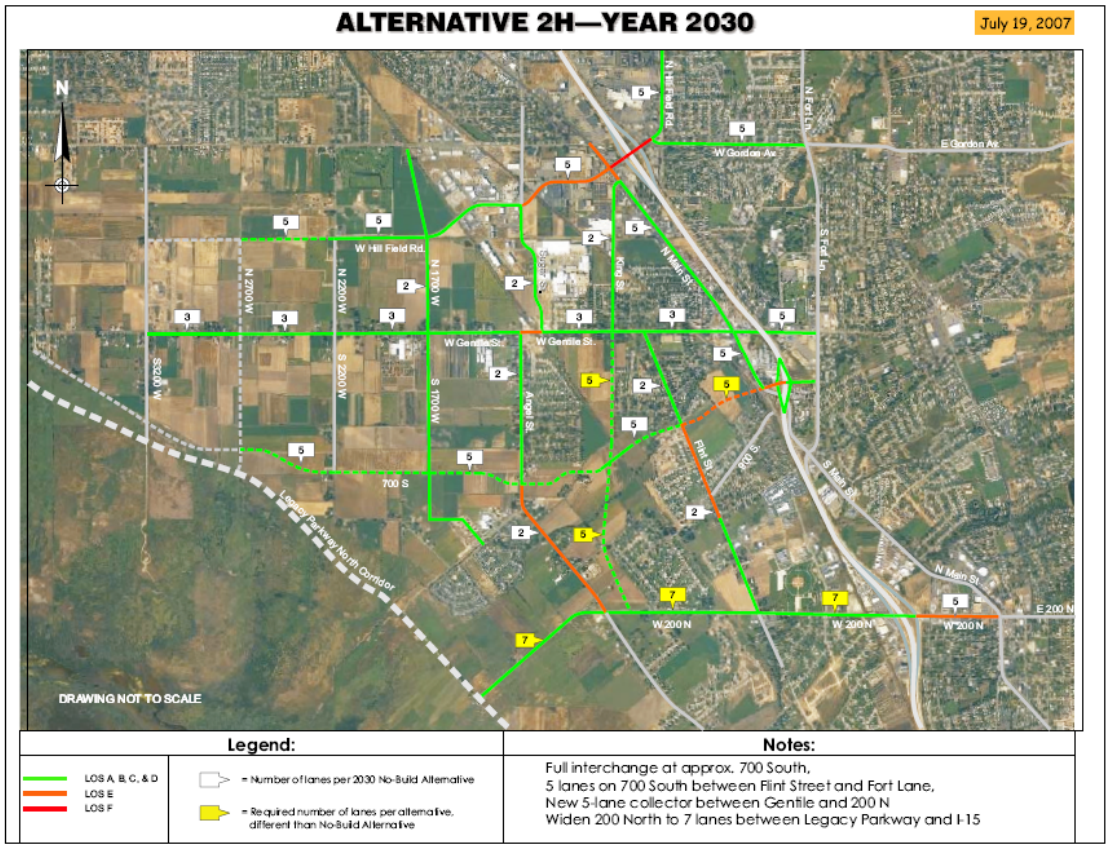

Figure C-5: Alternative 2H-Year 2030

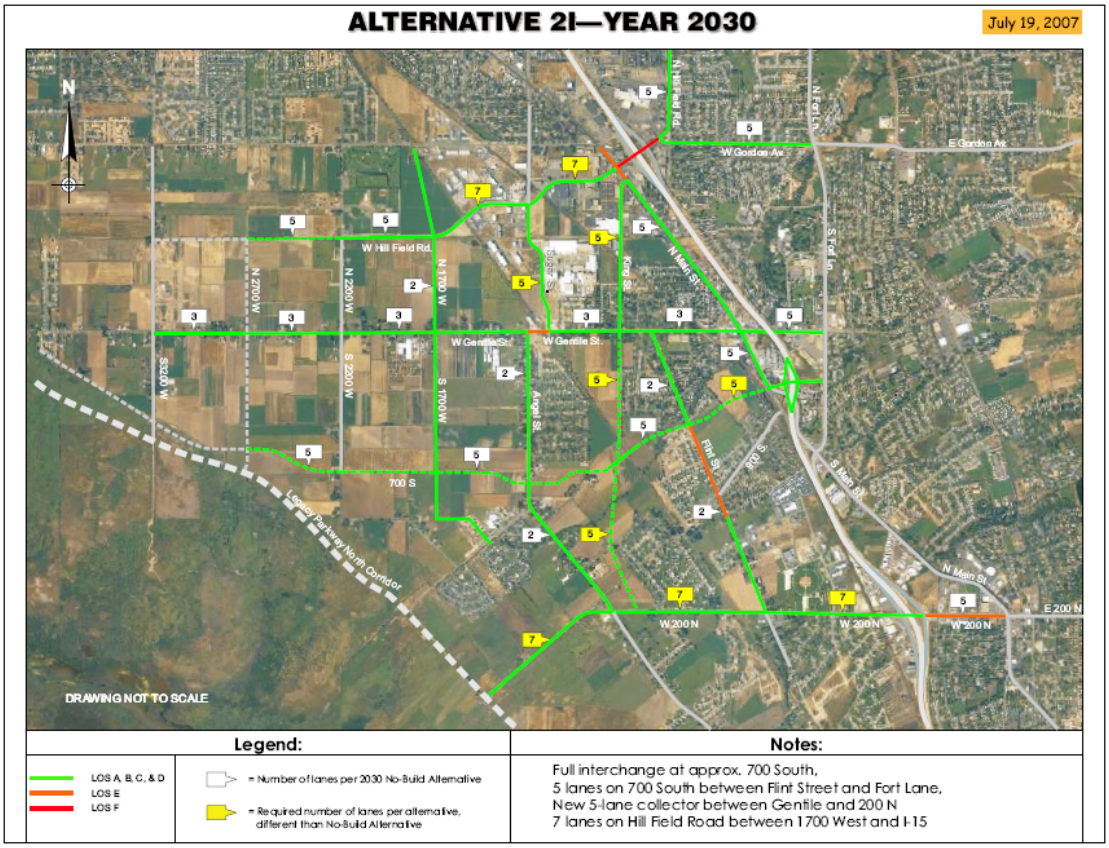

Figure C-6: Alternative 2I-Year 2030

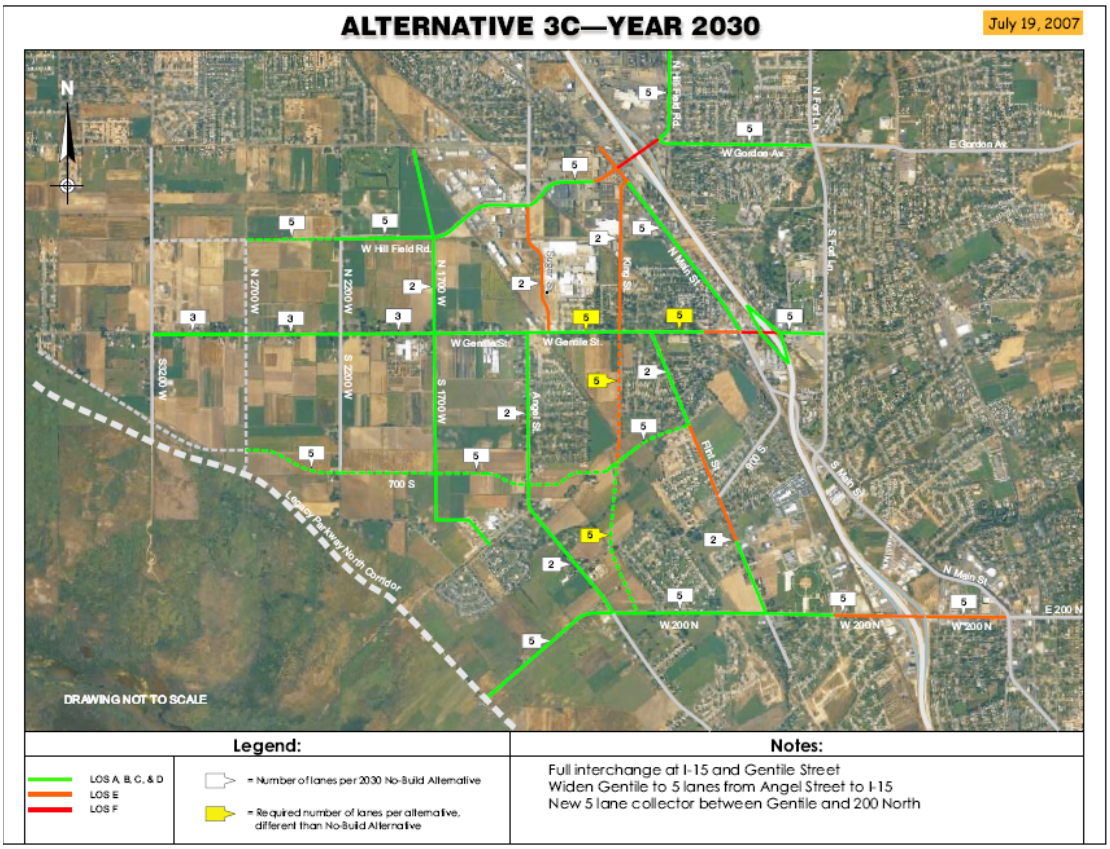

Figure C-7: Alternative 3C-Year 2030

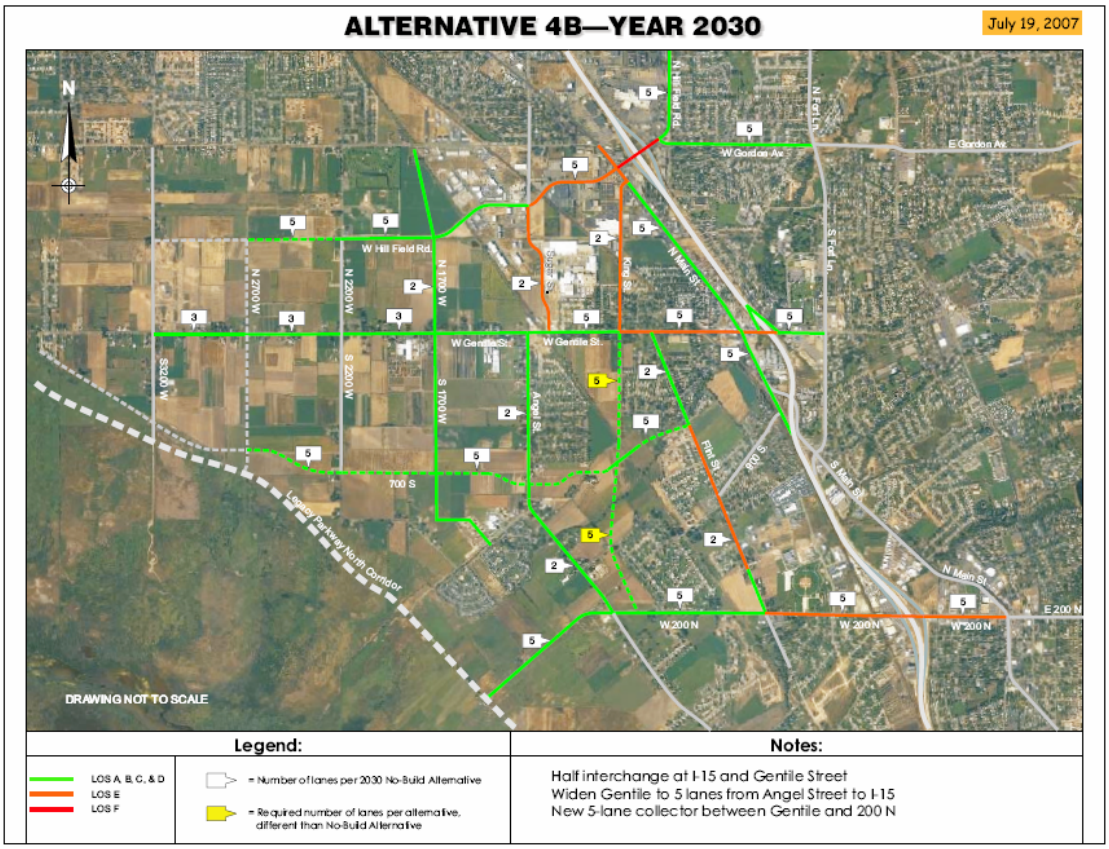

Figure C-8: Alternative 4B-Year 2030

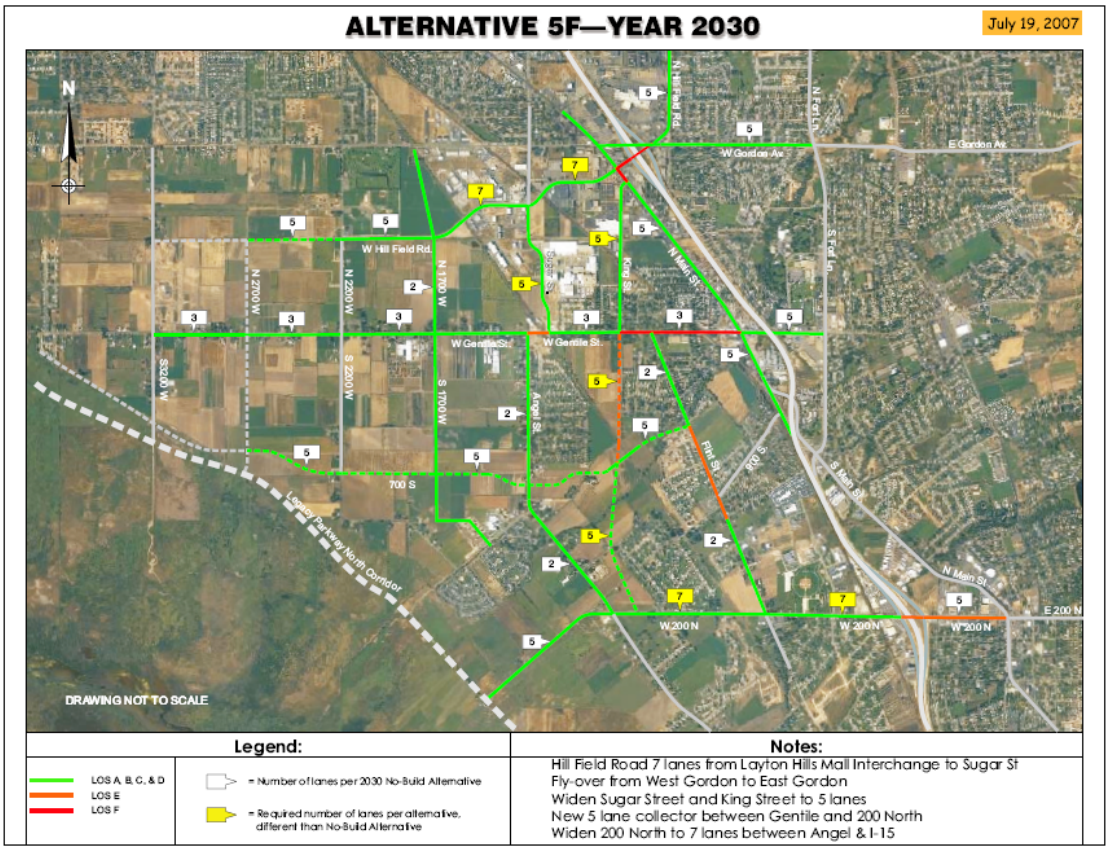

Figure C-9: Alternative 5F-Year 2030

APPENDIX D

2030 Turning Movement Volumes

Table D-1: Alternative 2F 2030 Traffic Volumes (King Street Extension as 3-Lane; 750 South Full Interchange) 7/11/2007

Intersection	Control	EB			WB			NB			SB			Intersection
		Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Total
Gentile Street														
2200 West	Signal	16	287	37	68	484	128	114	76	50	103	115	32	1510
1700 West	Signal	42	351	47	33	537	130	78	48	15	87	100	62	1530
Angel Street	Signal	0	401	49	398	592	0	105	0	275	0	0	0	1820
Sugar Street	Stop	142	528	0	0	762	218	0	0	0	263	0	227	2140
King Street	Signal	168	478	144	155	652	64	140	329	101	52	371	187	2841
Flint Street	Stop	0	507	123	147	723	0	146	0	124	0	0	0	1770
Main Street	Signal	187	301	161	111	442	577	332	875	72	646	888	96	4688
Wasatch Drive	Signal	121	899	0	0	900	80	0	0	0	64	0	226	2290
Fort Lane	Signal	82	742	135	253	817	179	92	378	270	127	422	72	3569
750 South														
2200 West	Signal	67	519	134	43	751	95	83	77	100	47	104	69	2089
1700 West	Signal	19	641	0	0	877	123	0	0	0	154	0	26	1840
Angel Street	Signal	28	590	191	270	818	192	136	170	284	156	209	46	3090
King Street	Signal	73	738	219	174	988	279	173	258	209	234	287	119	3751
Flint Street	Signal	37	1069	74	536	1346	257	46	46	538	211	60	49	4269
Main Street	Signal	432	1388	0	0	1603	847	0	0	0	626	0	533	5429
I-15	Signal	656	826	527	311	757	372	981	1	259	303	0	707	5700
Fort Lane	Signal	719	0	671	0	0	0	717	73	0	0	90	720	2990

Table D-2: Alternative 2G 2030 Traffic Volumes (King Street Extension as 5-Lane; 750 South Full Interchange) 7/11/2007

Intersection	Control	EB			WB			NB			SB			Intersection
		Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Total
Gentile Street														
2200 West	Signal	16	287	37	68	484	128	114	76	50	103	115	32	1510
1700 West	Signal	42	351	47	33	537	130	78	48	15	87	100	62	1530
Angel Street	Signal	0	411	39	379	611	0	84	0	266	0	0	0	1790
Sugar Street	Stop	143	527	0	0	773	207	0	0	0	233	0	217	2100
King Street	Signal	157	464	139	168	655	67	142	347	111	56	392	182	2880
Flint Street	Stop	0	503	127	143	727	0	163	0	127	0	0	0	1790
Main Street	Signal	189	313	169	116	445	579	333	873	74	633	875	92	4691
Wasatch Drive	Signal	157	863	0	0	894	46	0	0	0	71	0	219	2250
Fort Lane	Signal	70	724	116	270	801	188	76	332	273	141	414	65	3470
750 South														
2200 West	Signal	67	516	127	42	752	96	82	77	101	48	102	70	2080
1700 West	Signal	23	637	0	0	872	128	0	0	0	143	0	27	1830
Angel Street	Signal	26	584	180	271	824	186	132	158	289	156	199	44	3049
King Street	Signal	65	719	246	219	993	278	173	257	229	243	344	113	3879
Flint Street	Signal	36	1078	76	470	1399	211	55	44	540	168	49	53	4179
Main Street	Signal	426	1384	0	0	1557	853	0	0	0	640	0	520	5380
I-15	Signal	650	818	552	327	743	370	970	1	260	303	0	697	5691
Fort Lane	Signal	709	0	671	0	0	0	717	83	0	0	100	700	2980

Table D-3: Alternative 2H 2030 Traffic Volumes
(Alt 2G with 200 North 7-Lanes and 750 South 5-Lanes)
7/11/2007

Intersection	Control	EB			WB			NB			SB			Intersection
		Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Total
Gentile Street														
2200 West	Signal	27	256	47	56	474	140	124	93	32	81	127	42	1499
1700 West	Signal	27	305	38	40	538	122	88	51	21	95	102	53	1480
Angel Street	Signal	0	366	54	366	584	0	115	0	235	0	0	0	1720
Sugar Street	Stop	159	441	0	0	699	201	0	0	0	219	0	251	1970
King Street	Signal	131	441	108	194	603	83	124	407	149	81	467	173	2961
Flint Street	Stop	0	516	153	117	693	0	185	0	105	0	0	0	1769
Main Street	Signal	186	304	140	115	448	677	267	814	68	740	877	94	4730
Wasatch Drive	Signal	109	991	0	0	1008	62	0	0	0	51	0	209	2430
Fort Lane	Signal	100	797	133	192	881	167	95	334	212	129	395	96	3531
750 South														
2200 West	Signal	74	505	131	38	698	94	84	82	94	46	102	72	2020
1700 West	Signal	35	605	0	0	815	135	0	0	0	125	0	35	1750
Angel Street	Signal	29	487	214	208	726	136	186	185	249	125	227	58	2830
King Street	Signal	94	627	279	148	942	240	240	325	174	209	384	177	3839
Flint Street	Signal	11	905	94	412	1249	220	76	71	493	177	76	17	3801
Main Street	Signal	419	1181	0	0	1329	721	0	0	0	581	0	549	4780
I-15	Signal	621	671	478	312	529	389	896	0	304	344	0	625	5169
Fort Lane	Signal	593	0	727	0	0	0	560	60	0	0	78	642	2660

Table D-4: Alternative 2I 2030 Traffic Volumes
(Alt 2G with 200 North 7-Lanes, Hill Field Road 7-Lanes, and 750 South 5-Lanes)
7/11/2007

Intersection	Control	EB			WB			NB			SB			Intersection
		Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Total
Gentile Street														
2200 West	Signal	30	267	43	44	502	134	114	77	30	73	102	45	1461
1700 West	Signal	65	258	47	29	492	179	71	66	38	115	179	116	1655
Angel Street	Signal	0	366	44	351	599	0	100	0	235	0	0	0	1695
Sugar Street	Stop	161	439	0	0	701	199	0	0	0	211	0	249	1960
King Street	Signal	201	359	90	191	528	151	99	679	132	140	828	272	3670
Flint Street	Stop	0	504	116	134	726	0	144	0	116	0	0	0	1740
Main Street	Signal	103	337	180	203	471	516	335	740	125	619	848	54	4531
Wasatch Drive	Signal	175	904	0	0	899	21	0	0	0	21	0	249	2269
Fort Lane	Signal	59	757	74	201	812	188	61	263	246	133	236	50	3080
750 South														
2200 West	Signal	59	437	164	55	659	86	80	76	95	31	102	47	1891
1700 West	Signal	47	513	0	0	743	127	0	0	0	158	0	67	1655
Angel Street	Signal	26	435	209	214	675	130	175	178	237	109	217	50	2655
King Street	Signal	221	472	268	67	708	265	213	424	73	216	506	389	3822
Flint Street	Signal	11	645	105	372	938	180	88	90	442	139	94	17	3121
Main Street	Signal	511	739	0	0	821	689	0	0	0	561	0	669	3990
I-15	Signal	348	645	307	333	526	362	634	0	345	300	0	340	4140
Fort Lane	Signal	516	0	774	0	0	0	733	67	0	0	57	453	2600

Table D-5: Alternative 3C 2030 Traffic Volumes
(Gentile Street with 5-Lanes and Full Interchange at Gentile/I-15)
7/11/2007

Intersection	Control	EB			WB			NB			SB			Intersection
		Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Total
Gentile Street														
2200 West	Signal	14	336	50	122	537	151	120	85	75	109	138	23	1760
1700 West	Signal	23	430	68	105	651	153	124	74	52	108	147	35	1970
Angel Street	Signal	0	553	37	441	819	0	86	0	334	0	0	0	2270
Sugar Street	Stop	234	646	0	0	883	177	0	0	0	225	0	375	2540
King Street	Signal	44	752	74	758	903	159	94	398	738	184	426	61	4591
Flint Street	Stop	0	1465	205	265	1635	0	180	0	210	0	0	0	3960
Main Street	Signal	374	1055	242	137	1430	943	309	411	60	939	553	158	6611
I-15	Signal	400	1070	580	190	1050	570	820	0	420	330	0	640	6070
Wasatch Drive	Signal	184	1646	0	0	1523	77	0	0	0	64	0	276	3770
Fort Lane	Signal	295	1202	202	28	1044	48	268	229	74	46	140	274	3850
750 South														
2200 West	Signal	73	385	142	34	539	76	88	91	81	36	115	69	1729
1700 West	Signal	62	438	0	0	573	127	0	0	0	132	0	68	1400
Angel Street	Signal	37	343	180	154	495	151	143	232	175	122	266	62	2360
King Street	Signal	351	109	181	14	153	133	139	645	16	95	656	509	3001
Flint Street	Signal	39	0	181	0	0	0	210	350	0	0	380	90	1250

Table D-6: Alternative 4B 2030 Traffic Volumes
(Gentile Street with 5-Lanes and Half Interchange at Gentile/I-15)
7/11/2007

Intersection	Control	EB			WB			NB			SB			Intersection
		Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Lt	Th	Rt	Total
Gentile Street														
2200 West	Signal	14	337	49	123	541	146	117	80	73	109	138	23	1750
1700 West	Signal	24	434	63	92	646	152	125	75	50	116	145	39	1961
Angel Street	Signal	0	549	51	435	765	0	117	0	343	0	0	0	2260
Sugar Street	Stop	235	645	0	0	844	166	0	0	0	207	0	353	2450
King Street	Signal	39	736	75	786	861	144	92	368	751	177	427	56	4512
Flint Street	Stop	0	1449	211	269	1601	0	185	0	215	0	0	0	3930
Main Street	Signal	361	875	424	160	1120	609	591	648	81	657	817	156	6499
I-15 SB Ramp	Signal	0	1610	0	0	1240	0	0	0	0	340	0	650	3840
I-15 NB Ramp	Signal	380	1570	0	0	1240	570	0	0	0	0	0	0	3760
Wasatch Drive	Signal	176	1384	0	0	1495	65	0	0	0	51	0	289	3460
Fort Lane	Signal	258	1004	158	31	1049	59	239	253	78	53	151	267	3600
750 South														
2200 West	Signal	72	386	142	35	548	77	88	90	81	36	114	70	1739
1700 West	Signal	59	441	0	0	590	130	0	0	0	128	0	62	1410
Angel Street	Signal	35	345	181	172	520	158	141	227	182	123	268	59	2411
King Street	Signal	327	105	218	16	167	117	177	656	17	78	676	506	3060
Flint Street	Signal	37	0	163	0	0	0	207	353	0	0	378	92	1230

APPENDIX E

Intersection Geometry Schematics

Fig. E-1: Gentile Street and 2200 West – Alternatives 2G and 4B

Fig. E-2: Gentile Street and 1700 West – Alternatives 2G and 4B

Fig. E-3: Potential Angel/Sugar Street Re-Alignment –Alternative 2G

Fig. E-4: Potential Angel/Sugar Street Re-Alignment –Alternative 4B

Note: Intersection geometry schematics are not to scale.

Fig. E-5: Gentile Street - King Street and Flint Street–Alternative 2G

Fig. E-6: Gentile Street - King Street and Flint Street–Alternative 4B

Fig. E-7: Gentile Street - Main Street and Wasatch Drive–Alternative 2G

Note: Intersection geometry schematics are not to scale.

Fig. E-8: Gentile Street – Main Street, SB Off-Ramp, NB On-Ramp, and Wasatch Drive – Alternative 4B

Fig. E-9: Gentile Street and Fort Lane – Alternatives 2G and 4B

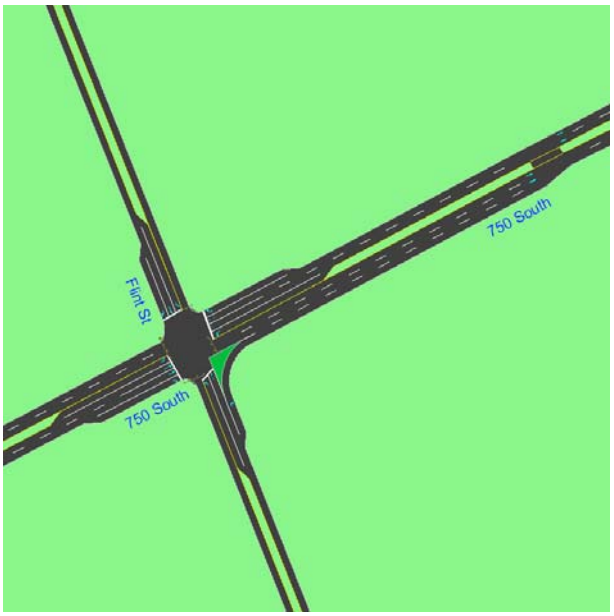

Fig. E-10: 750 South and F–Alternative 2G

Note: Intersection geometry schematics are not to scale.

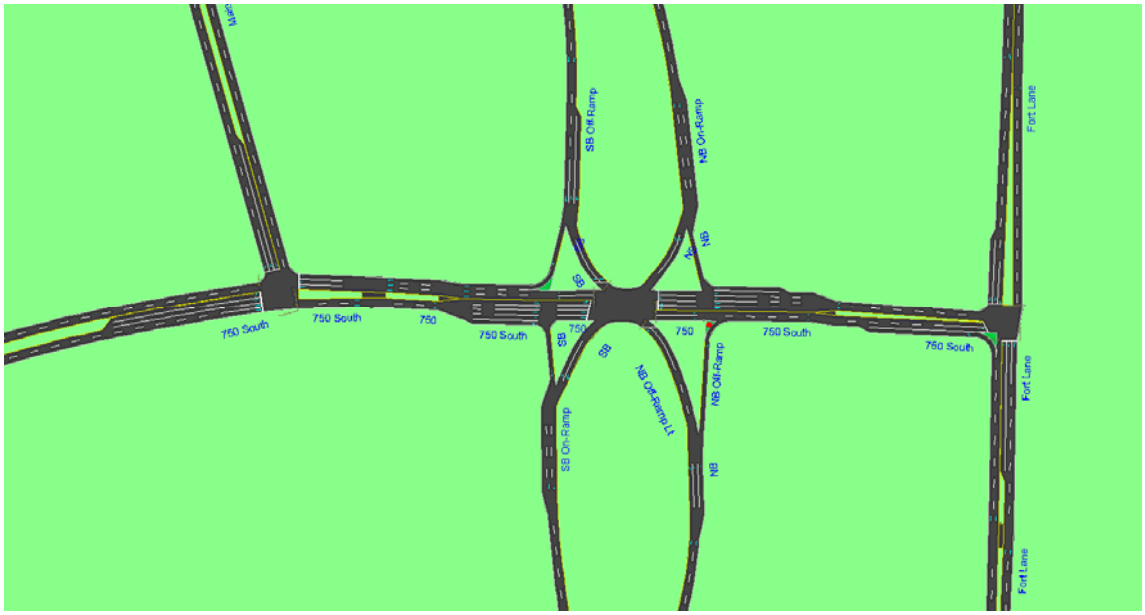

Fig. E-11: 750 South – Main Street, I-15 SPUI, and Fort Lane–Alternative 2G

APPENDIX F

Maximum Daily Traffic Capacity Estimates

HORROCKS ENGINEERS

Table F-1: Utah/Wasatch Front Specific Maximum Daily Traffic Capacity Estimate

Suburban				Rural				Urban/CBD			
2 Lane				2 Lane				2 Lane			
	Freeway	Arterial	Collector		Freeway	Arterial	Collector		Freeway	Arterial	Collector
LOS A	NA	5,500	5,000	LOS A	NA	5,000	3,500	LOS A	NA	6,500	5,500
LOS B	NA	7,500	7,000	LOS B	NA	8,500	5,500	LOS B	NA	7,500	6,500
LOS C	NA	10,000	9,000	LOS C	NA	12,000	7,500	LOS C	NA	8,500	7,500
LOS D	NA	11,500	10,500	LOS D	NA	15,500	9,500	LOS D	NA	10,000	9,000
LOS E	NA	15,000	13,500	LOS E	NA	19,500	12,000	LOS E	NA	10,500	9,500
3 Lane				3 Lane				3 Lane			
	Freeway	Arterial	Collector		Freeway	Arterial	Collector		Freeway	Arterial	Collector
LOS A	NA	7,000	5,500	LOS A	NA	5,500	4,000	LOS A	NA	7,500	6,500
LOS B	NA	9,000	7,500	LOS B	NA	9,000	6,000	LOS B	NA	9,500	8,500
LOS C	NA	11,500	10,000	LOS C	NA	13,000	8,500	LOS C	NA	12,000	10,500
LOS D	NA	13,000	11,500	LOS D	NA	16,500	10,500	LOS D	NA	14,000	12,500
LOS E	NA	16,500	15,000	LOS E	NA	21,000	13,500	LOS E	NA	17,000	15,000
4 Lane				4 Lane				4 Lane			
	Freeway	Arterial	Collector		Freeway	Arterial	Collector		Freeway	Arterial	Collector
LOS A	31,500	14,000	10,000	LOS A	20,500	8,500	7,000	LOS A	36,500	13,000	9,500
LOS B	45,500	19,500	14,500	LOS B	35,000	14,500	11,500	LOS B	49,500	17,500	12,500
LOS C	60,000	25,000	19,000	LOS C	50,000	20,500	16,000	LOS C	63,000	22,000	16,000
LOS D	70,000	29,000	22,500	LOS D	63,000	26,000	20,500	LOS D	73,000	26,000	19,000
LOS E	89,000	36,500	28,500	LOS E	80,000	33,000	25,500	LOS E	90,000	31,500	23,000
5 Lane				5 Lane				5 Lane			
	Freeway	Arterial	Collector		Freeway	Arterial	Collector		Freeway	Arterial	Collector
LOS A	NA	14,500	12,000	LOS A	NA	9,500	8,000	LOS A	NA	17,000	13,500
LOS B	NA	20,500	16,500	LOS B	NA	15,500	13,000	LOS B	NA	22,500	18,000
LOS C	NA	26,500	21,500	LOS C	NA	22,000	18,000	LOS C	NA	28,000	22,500
LOS D	NA	30,500	25,000	LOS D	NA	28,000	22,500	LOS D	NA	32,500	26,000
LOS E	NA	39,000	31,500	LOS E	NA	35,000	28,500	LOS E	NA	39,500	32,000
6 Lane				6 Lane				6 Lane			
	Freeway	Arterial	Collector		Freeway	Arterial	Collector		Freeway	Arterial	Collector
LOS A	51,000	18,500	NA	LOS A	29,500	12,500	NA	LOS A	58,500	20,500	NA
LOS B	72,500	26,500	NA	LOS B	50,500	21,500	NA	LOS B	79,000	27,500	NA
LOS C	95,000	35,000	NA	LOS C	72,000	30,500	NA	LOS C	100,000	35,000	NA
LOS D	110,000	40,500	NA	LOS D	91,000	39,000	NA	LOS D	116,000	40,500	NA
LOS E	140,000	52,000	NA	LOS E	115,000	49,000	NA	LOS E	142,000	50,000	NA
7 Lane				7 Lane				7 Lane			
	Freeway	Arterial	Collector		Freeway	Arterial	Collector		Freeway	Arterial	Collector
LOS A	NA	21,500	NA	LOS A	NA	13,500	NA	LOS A	NA	25,000	NA
LOS B	NA	30,500	NA	LOS B	NA	23,000	NA	LOS B	NA	33,500	NA
LOS C	NA	40,000	NA	LOS C	NA	33,000	NA	LOS C	NA	42,000	NA
LOS D	NA	46,000	NA	LOS D	NA	42,000	NA	LOS D	NA	49,000	NA
LOS E	NA	59,000	NA	LOS E	NA	53,000	NA	LOS E	NA	59,500	NA
8 Lane				8 Lane				8 Lane			
	Freeway	Arterial	Collector		Freeway	Arterial	Collector		Freeway	Arterial	Collector
LOS A	66,500	NA	NA	LOS A	NA	NA	NA	LOS A	78,000	NA	NA
LOS B	95,500	NA	NA	LOS B	NA	NA	NA	LOS B	105,000	NA	NA
LOS C	126,000	NA	NA	LOS C	NA	NA	NA	LOS C	133,000	NA	NA
LOS D	146,000	NA	NA	LOS D	NA	NA	NA	LOS D	154,000	NA	NA
LOS E	187,000	NA	NA	LOS E	NA	NA	NA	LOS E	189,000	NA	NA

Assumes phf between 8% and 12%, higher for better LOS and less urban conditions;
Right turn lanes will increase capacity approximately 5% to 10%;
Use with caution based on signal spacing, access management and other issues.

APPENDIX G

WFRC Travel Demand Model Output

AM 3-Hr vs. PM 3-Hr

Alternative 2G

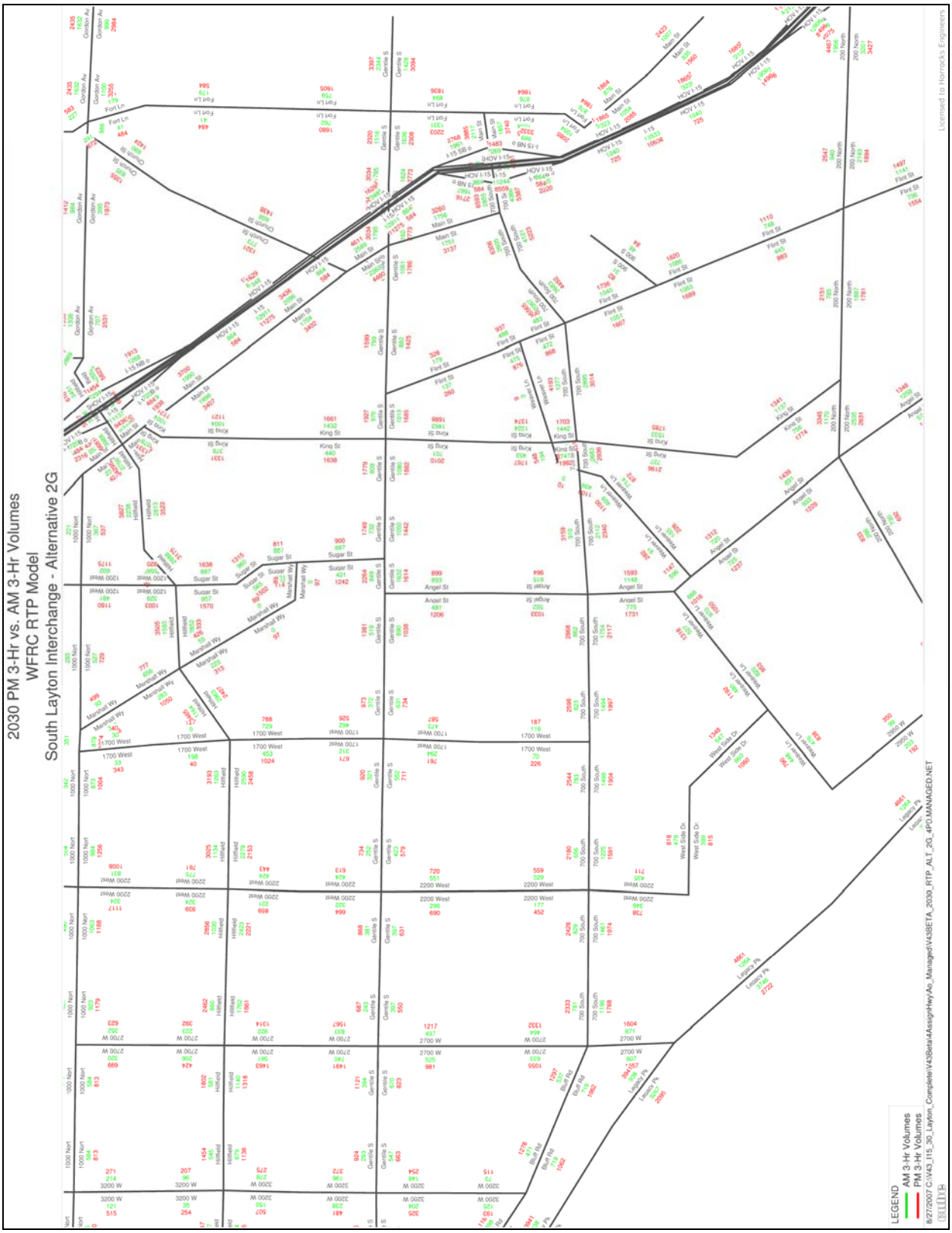

Figure G-1: 2030 PM 3-Hr vs. AM 3-Hr Volumes for South Layton Interchange-Alternative 2G

APPENDIX H

Traffic Operations Analysis Output Files